



METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS
TRANSPORTATION PLANNING BOARD
TRANSPORTATION/LAND-USE CONNECTIONS (TLC) PROGRAM GRANT

MONTGOMERY COUNTY
BUS RAPID TRANSIT STATION PROTOTYPE DESIGN

PROJECT SUMMARY :: July 2017



DEVELOPED FOR:

**The Montgomery County
Department of Transportation**

FUNDED BY:

**The Metropolitan Washington
Council of Governments
Transportation Planning Board
Transportation / Land-Use
Connections Program**

DESIGNED BY:

**ZGF Architects LLP
Wiles Mensch Corporation**

TABLE OF CONTENTS

BRT PROTOTYPE STATION DESIGN

Project Overview	1
Project Purpose	
Design Process	
Design Summary	2
Design Goals	2
Design Precedents	2
Program of Requirements - Station Amenities	2
Prototype Station Design	4
Public Input	4
Station Adaptability	4
Conceptual Approaches	5
Station Marker	5
Station Framework	6
Station Architecture Components	8
Station Platform Capacity and Canopy Coverage	10
Prototype Station Test Fits	12
Urban Mixed-Use, Suburban Residential & Commercial, Park & Ride	
Design Features	14
Landscape Design and Stormwater Management	14
Sustainability - Energy Production	16
Public Art - Opportunities	17
Branding - System and Station Identification	18
Station Planning - Conceptual Budget Estimate	19

APPENDIX - DESIGN PROCESS EXHIBITS:

Kick-off Meeting - Agenda and Summary	23
Workshop 1 - Meeting Summary and Exhibits	29
Workshop 2 - Meeting Summary and Exhibits	43
Workshop 3 - Meeting Summary and Exhibits	57
Public Open Houses - MD 355 and US 29	67



THE PROTOTYPE STATION, AT NIGHT

The Prototype Station Marker and Canopy, with Ticket Vending, Lighting, Signage, Seating, Wind Protection and Landscape

BRT STATION PROTOTYPE DESIGN

Project Overview

Project Purpose

This project has been funded through a Metropolitan Washington Council of Governments Transportation Planning Board Transportation/Land Use Connections Program Grant.

The purpose of the project is to define a program of requirements for a customizable station prototype to support current planning efforts for proposed Bus Rapid Transit corridors in Montgomery County, including MD 355 (Wisconsin Ave/Rockville Pike), US 29 (Colesville Rd/Columbia Pike), and MD 586 (Veirs Mill Rd).

To guide the development of the Prototype Design, MCDOT established the following design parameters:

- The Station Prototype should be adaptable for right-side curb drop off, and center median stops.
- Pedestrian access for end and side loading should be considered.
- The station design will include interchangeable components to respond to potential ranges of ridership on each corridor, and during peak/non peak hours.
- The design should be flexible enough to apply to all three corridors, and have adjustable design components addressing existing land uses, ridership projections, BRT bus fleet, Ride On and WMATA bus fleet, ADA accessibility, vehicle capacity, wayfinding, and branding.
- Station amenities will include: canopy/wind screen weather protection, seating, lighting, fare payment, dynamic and static information displays, landscaping/hardscaping, and bike accommodations.
- Opportunities for green infrastructure and sustainability strategies shall be identified.
- Opportunities for the incorporation of public art shall be identified.
- Prototypical design concepts shall be sensitive to cost, schedule and production.
- Upon successful development and implementation of the station concept, the design shall be transferable to other jurisdictions/partners of Montgomery County:

Design Process

Design Workshops

The prototype design was initiated with a MWCOG/MCDOT Kick-off Workshop to confirm preliminary project goals. Subsequently, the prototype design has been developed with input from a Technical Advisory Group (TAG) assembled by MCDOT. The group included representatives from local jurisdictions that will be served by the BRT System and regional transportation departments, including Maryland Transit Administration (MTA), State Highway Administration (SHA), WMATA, Cities of Rockville and Gaithersburg, Howard County, Arlington, Alexandria, County Council and M-NCPPC. The prototype design was developed over three workshops with the TAG:

- Workshop 1 - December 16, 2016
- Workshop 2 - February 21, 2017
- Workshop 3 - April 18, 2017

Summaries of the Kick-off meeting and each Workshop and the their respective design exhibits are included in the Appendix.

Public Open Houses & Advisory Committee Meetings

In an effort to collect community input to inform concept development, the design team attended public open houses for two of the proposed BRT lines and Advisory Committee meetings for all three corridors:

Public Open Houses

- MD 355 - February 7 & 8, 2017
- US 29 - March 7, 13 & 15, 2017

Citizen Advisory Committee Meetings

- MD 355 - May 16 & 18, 2017
- US 29 - May 23, 24 & 25, 2017
- MD 586 - June 14, 2017

The design exhibits used for the Public Open Houses are included in the Appendix.

DESIGN SUMMARY

This summary provides an overview of the conceptual prototype design, organized by the following subjects: Station Design Goals, Design Precedents, Program of Requirements - Station Amenities, and Prototype Station Design.

Station Design Goals

In consultation with MCDOT, the Technical Advisory Group, and the Public, the following design goals have been used to guide the conceptual development of the station prototype.

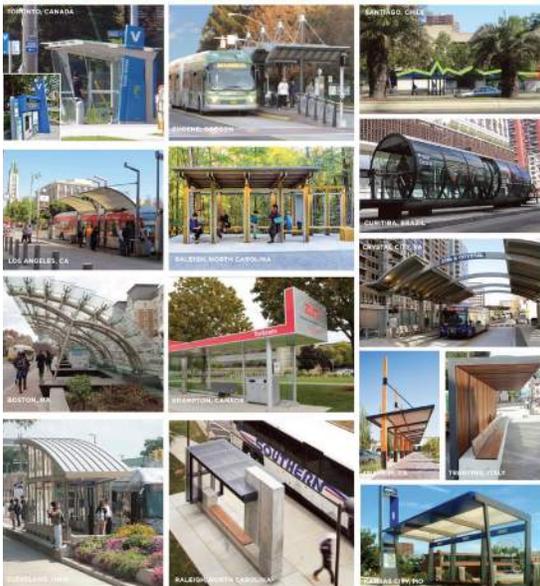
The BRT Station should be:

1. Easy to Find and Use
2. Accessible
3. Safe and Comfortable
4. Adaptable and Context Sensitive
5. Maintainable
6. A Good Life-Cycle Investment

Design Precedents

Precedent images of national and international bus station designs were presented and discussed with the TAG and the public. The key station design elements identified for consideration in the prototype design included: Scale, Form, Image, Enclosure, Material, Transparency and Lighting. The image below provides a snapshot of an Image Board used - please refer to Appendix pages 48, 69, 70 & 73 for reproductions of the actual boards used.

SCALE, FORM, IMAGE & ENCLOSURE



Program of Requirements - Station Amenities

The Program of Requirements Matrix (opposite page), has been developed to guide the incorporation of station amenities. It is organized to objectively guide decisions on which amenities shall be included for each station, and which amenities may be included or dependent on each station's **CAPACITY** (column two) and **CONTEXT** (column three).

The first column, **STATION AMENITIES MENU**, is separated into 5 categories:

- **Teal: Base Station Types**
- **Blue: Shelter & Furnishings**
- **Orange: Public Art**
- **Purple: Communication and Utility**
- **Green: Landscape and Low Impact Development**

The second column, **CAPACITY**, is based on a projected quantity of users at the station. The three ranges to be considered are: Low, Medium, and High. For this study, the ranges are intended to be relative, with low capacity reflecting stations that have the least ridership that may not require all station amenities, and high capacity stations reflecting stations that will require the greatest amount of amenities. Actual capacity numbers and related amenities should be evaluated for each line and station during the planning stage and also following implementation for any potential refinements. As the legend below illustrates, the solid circles represent the basic amenity item which shall be included for each capacity, while open circles represent amenities which may be included and will be dependant on policy decisions or space restrictions.

The third column, **CONTEXT**, provides guidance on how amenities may be increased or reduced, dependent on the context of the site. The Matrix uses "+" and "-" to inform whether amenities may be increased or reduced based on available area at the station. The two contexts identified are Suburban Residential/Open Space and Urban Mixed Use/Restricted Space.

STATION AMENITIES LEGEND

INCLUSION OF AMENITIES BASED ON CAPACITY

- ADDITIONAL AMENITIES MAY BE INCLUDED
- BASIC AMENITY REQUIREMENT
- OPTIONAL AMENITY / SPECIFIC TO SITE CONDITIONS

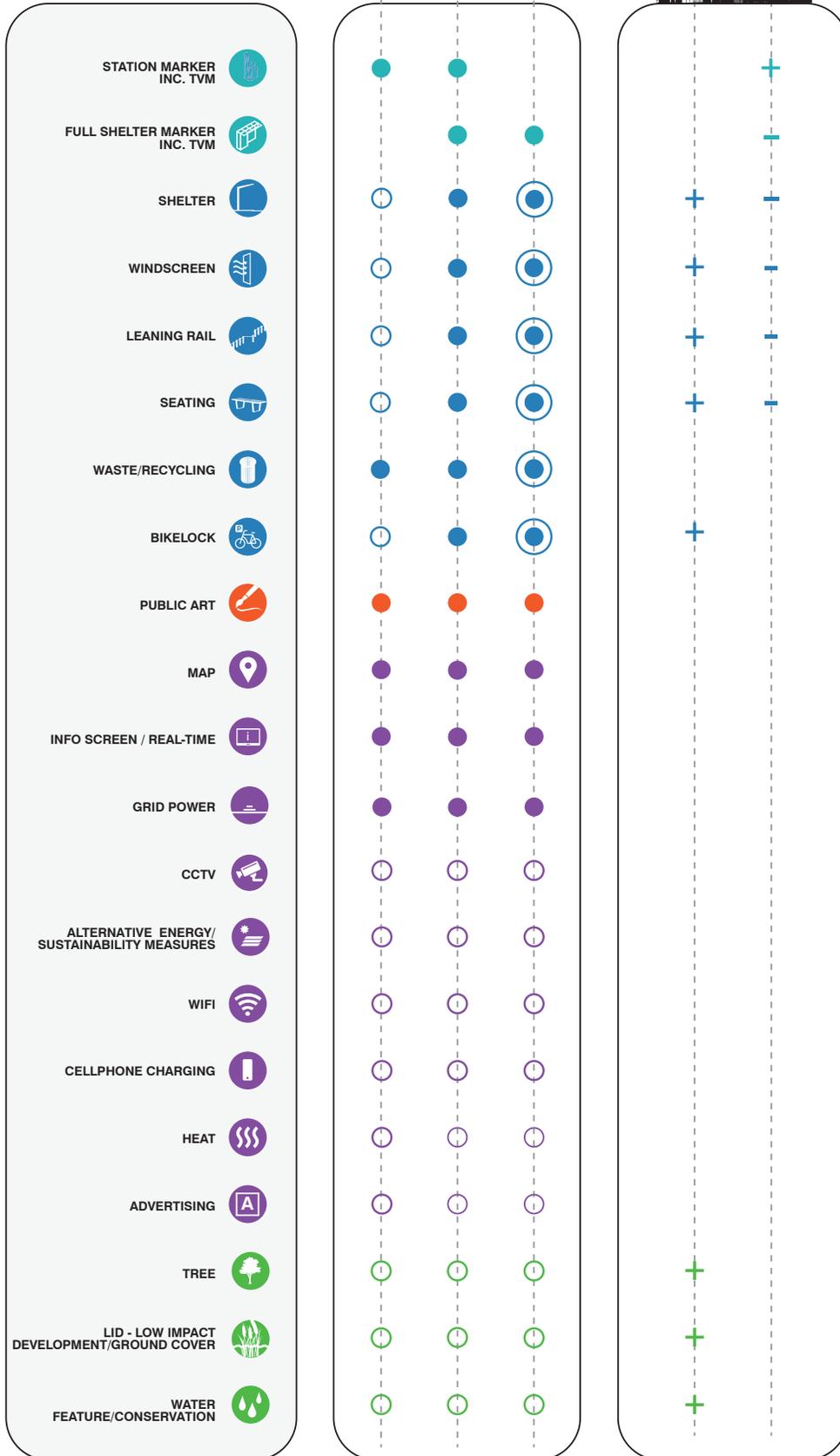
INCLUSION OF AMENITIES BASED ON SITE CONDITIONS

- ADDITIONAL AMENITIES MAY BE INCLUDED IF SITE ALLOWS
- AMENITIES MAY NOT BE INCLUDED IF LIMITED BY SITE AREA

STATION AMENITIES MENU

CAPACITY

CONTEXT



PROTOTYPE STATION DESIGN

The Conceptual Design for the Prototype Station has evolved through consultation with MCDOT, the TAG and the general public. The Design explanation includes the following: Public Input, Station Adaptability, Conceptual Approaches, Station Marker, Station Framework, Station Architecture Components, Platform Weather Protection, Station Test Fits, Design Features, and Conceptual Budget Estimate.

Public Input

During the public open houses, the most frequent aspirations for the station design were that it should reflect a "green" approach, and be respectful of the area's natural resources (see word cloud below). This sentiment has reinforced the design strategy to incorporate landscape at each station, to the extent possible. In conversations with members of the public, the history of Montgomery County's quarries was also identified as a potential source of local materials which may be used to provide station design identity.

OPEN HOUSE WORD CLOUD ASPIRATIONS

MD 355 - DESCRIBE IN ONE WORD HOW A DESIGN MIGHT REFLECT THE CHARACTER AND QUALITY OF MONTGOMERY COUNTY?



LOCAL MATERIALS

SENECA QUARRY, CIRCA 1890



Station Adaptability

During Workshop 2, two approaches for increasing shelter capacity were investigated and discussed:

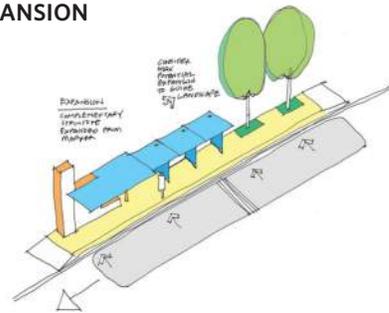
- Expansion - an option to increase shelter size through linear expansion;
- Repetition - an option to increase shelter coverage through introduction of multiple, independent canopies.

At the workshop, there was general consensus among MCDOT and the TAG that the Repetition approach should be pursued, as it would allow the greatest flexibility, the use of modular elements, the inclusion of permanent landscape at initial implementation, and be least disruptive to operating stations during potential future modifications.

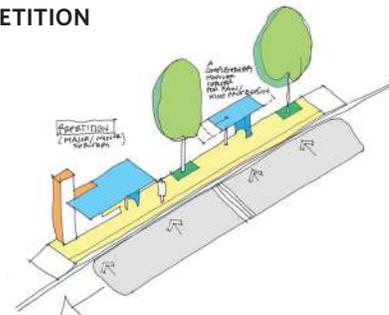
STATION ADAPTABILITY

EXCERPTS FROM WORKSHOP #2, APPENDIX PAGE 51

EXPANSION



REPETITION



Conceptual Approaches

During Workshop 2, four potential conceptual approaches for the architecture of the station shelters were discussed: Plains, Facet, Uplift and Sails.

MCDOT and the TAG generally expressed a preference for the Facet and Uplift approaches as being more appropriate for the Montgomery County context as Plains felt too "Midwest" and Sails seemed too "Coastal".

For Workshop 3, a "hybrid" of the Uplift and Facet was developed for review with the group and it has received conceptual approval. This "hybrid" approach is illustrated on the following pages and in the Appendix.

Station Marker

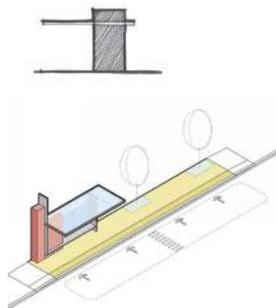
The conceptual design of the Station Marker supports the goal of system identity and ease of use. The Marker will incorporate a system logo with lighting, and provide route signage and real-time information for rider convenience.

To accommodate flexibility with the addition of future BRT lines in the County, the Marker should be similar in design throughout the system, though may incorporate some variation, such as color schemes, to differentiate BRT routes.

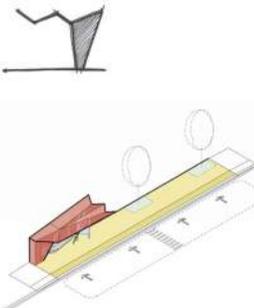
PRELIMINARY STATION CONCEPTS

EXCERPTS FROM WORKSHOP #2, APPENDIX PAGE 52 & 53

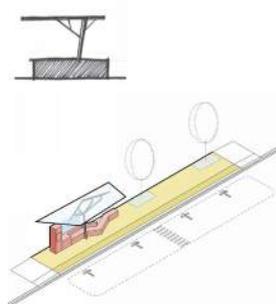
PLAINS



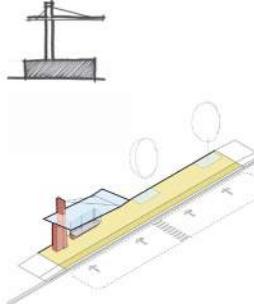
FACET



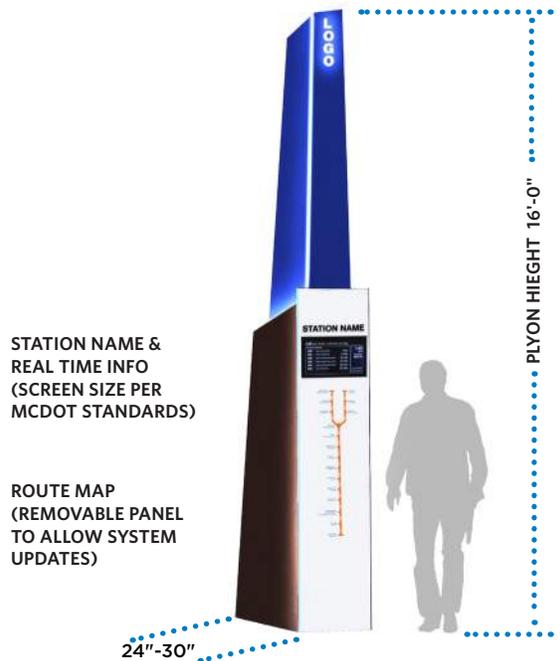
UPLIFT



SAILS



STATION MARKER



NOTE: MARKER IS SHOWN WITH A BLUE COLOR SCHEME FOR ILLUSTRATIVE PURPOSES. FINAL COLOR SCHEME(S) MAY VARY BY ALIGNMENT

Station Framework

The diagrams to the right illustrate the conceptual framework for how a station may be built based on initial ridership projections and specific context, while also being adaptable to potential increases in future ridership through the "Repetition" strategy.

The Station Framework assumes a 65' long platform to accommodate a 60' articulated low-floor bus with level boarding, with a station platform height of 10-12" above roadway, and off-board fare collection. For constrained station areas, a 50-55' long platform may be developed to fit into the context.

STATION TYPES

Type 1 illustrates a minimum station included in an urban context, with only a marker and Ticket Vending Machine (TVM) provided within the existing sidewalk furnishing zone.

Types 2-6 illustrates how an increasing amount of amenities may be provided for a side-loading station based on initial ridership projections. To accommodate future inclusion of additional shelters, the platform foundations shall be constructed with footings for future shelters and conduits for future utilities. This will allow additional shelters to be added in later phases in the most efficient manner.

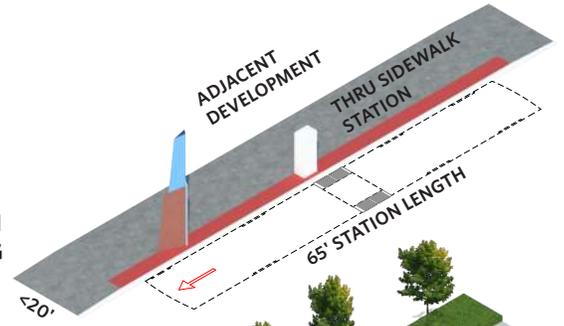
Type 7 illustrates a double station, anticipated to be used at Park & Ride locations.

Type 8 illustrates a two-way center loading median platform, designed to accommodate buses with left side doors.

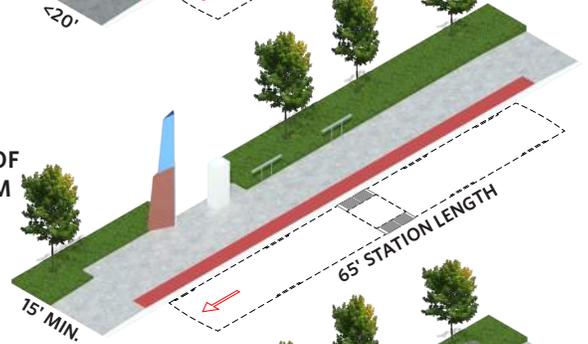
Type 9 illustrates a two-way side-loading median platform, designed to accommodate buses with right side doors.

With the exception of Station Type 1, which is intended to fit within an existing constricted streetscape, Platform Types 2 through 9 shall incorporate landscape as part of the BRT improvements.

**TYPE 1
URBAN
CONTEXT
- MARKER
AND TVM IN
FURNISHING
ZONE**



**TYPE 2
MARKER
AT BACK OF
PLATFORM**



**TYPE 3
MARKER +
SMALL
SHELTER**



**TYPE 4
MARKER +
LARGE
SHELTER**



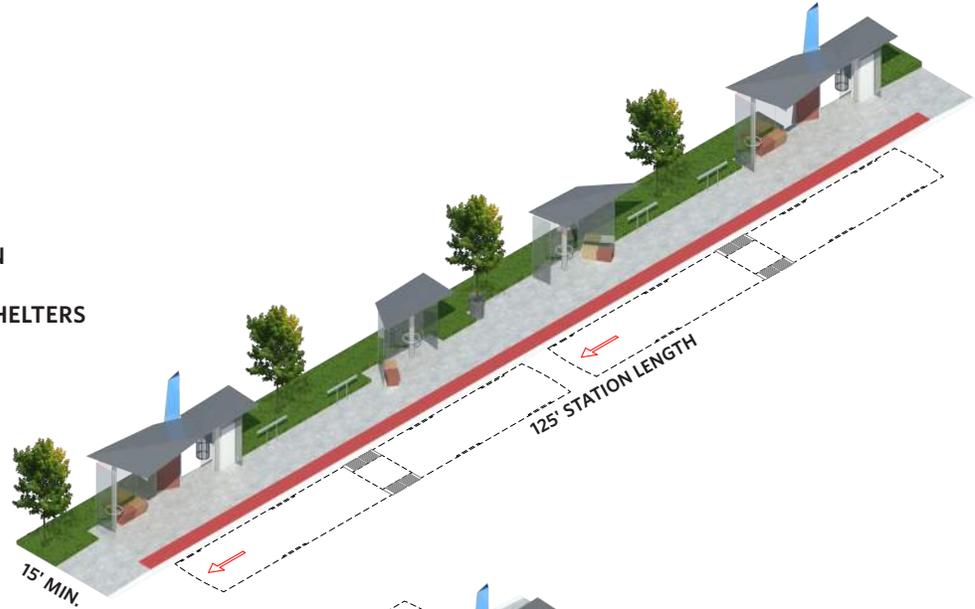
**TYPE 5
MARKER +
1 LARGE &
1 SMALL
SHELTER**



**TYPE 6
MARKER
+ 2 LARGE
SHELTERS**



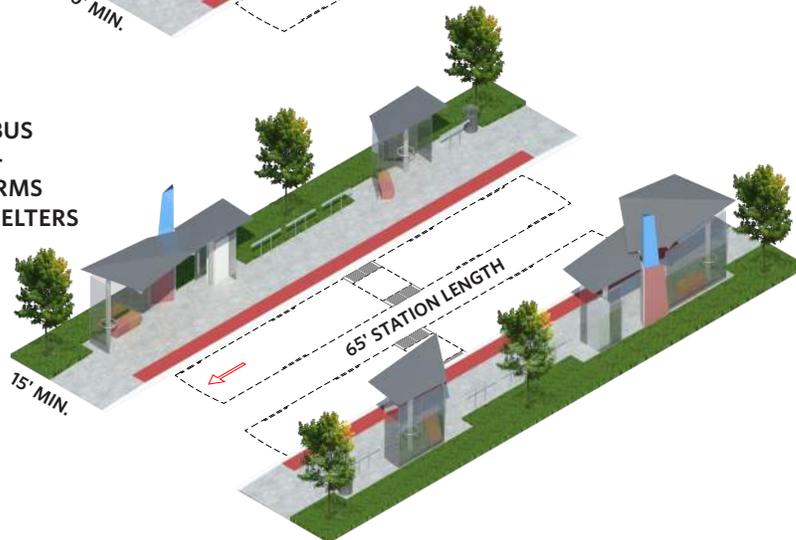
TYPE 7
DOUBLE STATION
HIGH CAPACITY -
2 MARKERS + 4 SHELTERS



TYPE 8
CENTER MEDIAN STATION
2 MARKERS + 2 SHELTERS



TYPE 9
CENTER MEDIAN BUS
LANES WITH SIDE-
LOADING PLATFORMS
2 MARKERS + 4 SHELTERS



Station Architecture Components



The Prototype Station Design includes the following **Station Architecture Components**. All elements shall meet ADA requirements. Refer to the Design Features section for information on Landscape Design and Stormwater Management, Sustainability & Energy Production, Public Art and Branding.

STATION MARKER

- Stone veneer and metal with painted or powder-coat finish

REAL TIME INFORMATION

- Real Time Information may be accommodated in multiple locations. The Station Marker is sized to include a larger screen to provide more detailed information. Smaller, solar-powered Real Time Signage may also be incorporated into the Windscreen frames.

PLATFORM

- ADA accessible, cast-in-place concrete with precast tactile warning strips

CANOPY STRUCTURE

- Metal structural columns, with painted or powder-coat finish, with either engineered wood panels and metal roof, or glass canopy, or combination of both. The decision on roof material may be made on a site specific basis based on need for shade or natural light. The Canopy structure shall be sloped to drain toward landscape areas. An integrated, "on-demand" heating element may be included as an optional feature.

WINDSCREENS

- Freestanding tempered glass windscreens, with minimal painted metal frame. The inclusion of freestanding windscreens will facilitate the potential site-specific location of windscreens to respond to specific microclimate conditions in support of rider comfort.

LEANING/GUARD RAILS

- Metal, with finish to match canopy structure

SEATING

- Stone slab or stone veneer, with potentially wood seating

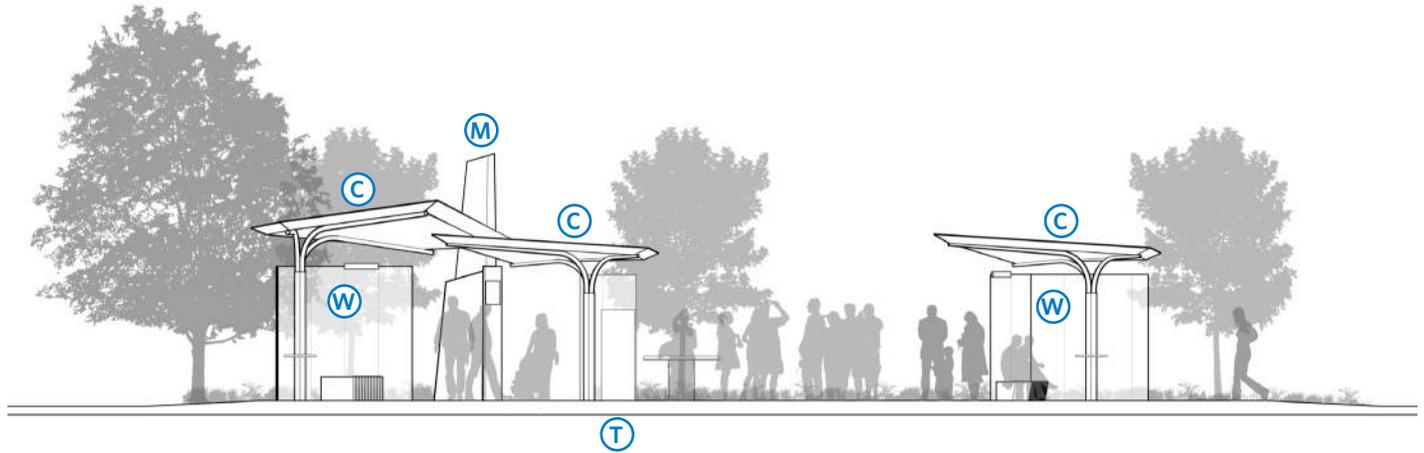
FURNISHINGS

- Trash/Recycling, Bike Racks to complement shelter design and conform to MCDOT standards

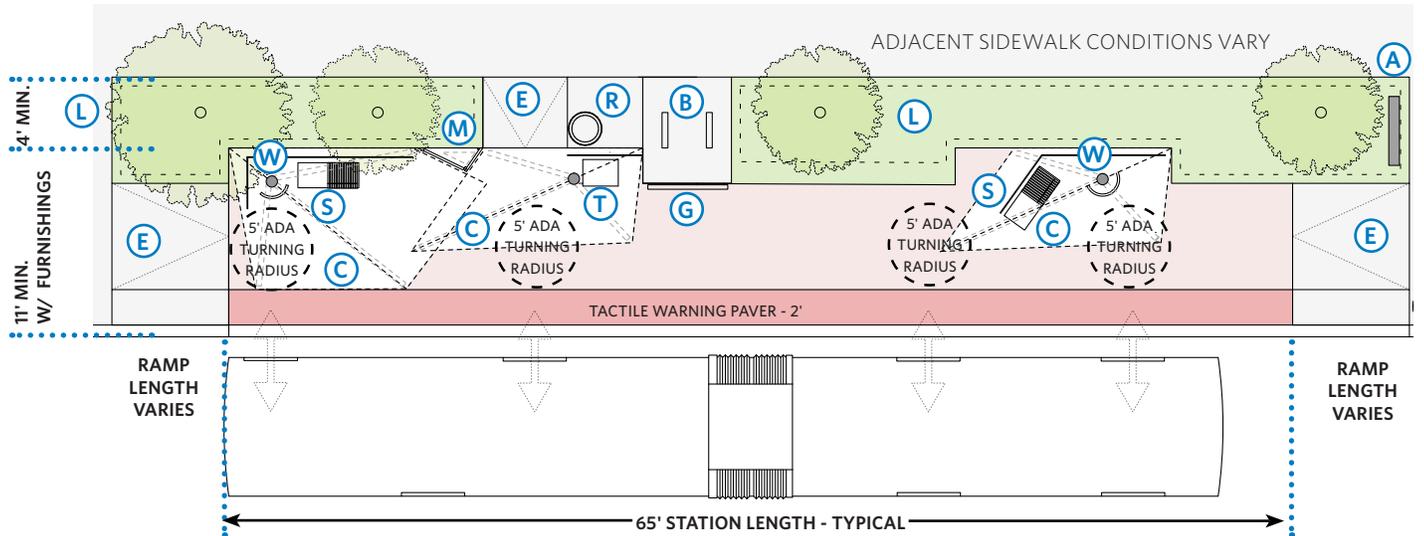
ADVERTISING PANEL (OPTIONAL)

- Freestanding blade panel, located in furnishing zone to ensure clear visibility is preserved for transit riders while also providing clear visibility for advertising panel

PROTOTYPE STATION ELEVATION (TYPE 5 EXAMPLE)



PROTOTYPE STATION PLAN (TYPE 5 EXAMPLE)

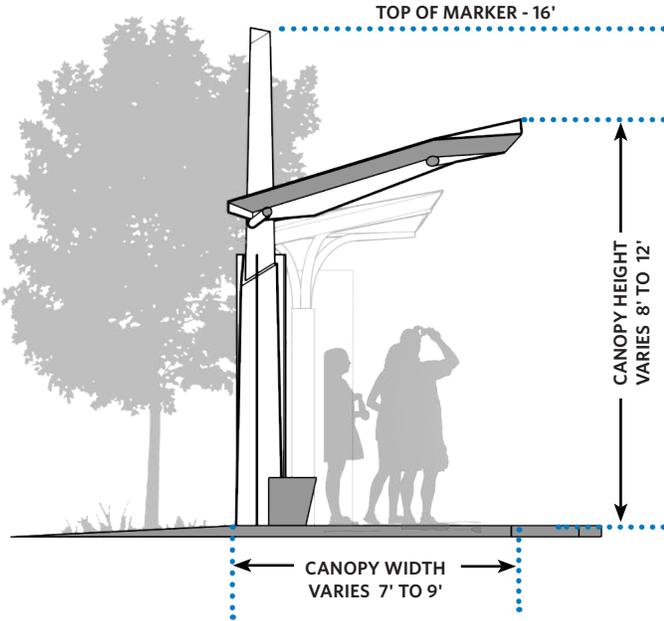


Elevation and Plan Key:

- (E) Potential Station Entrances
- (M) Marker (Logo, Route Map, Real Time Information)
- (T) Ticket Vending Machine
- (C) Station Canopy (shown dashed)
- (W) Windscreen
- (S) Bench Seating
- (G) Leaning / Guard Rail
- (L) Landscape / Trees and Low-Impact Development Tree Wells
- (R) Trash and Recycling Receptacle
- (B) Bike Racks within station area, additional racks may be included along adjacent streetscape areas
- (A) Advertising Panel

Station Platform Capacity and Canopy Coverage

PROTOTYPE STATION SECTION



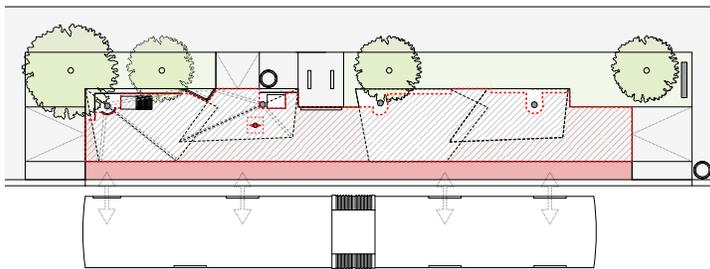
PLATFORM CAPACITY

The development of the Conceptual Design for the Prototype Station considered platform capacity and weather protection.

The diagrams, and information below, and to the right, provide an overview of each factor, by Square Foot area (SF) and Occupant Load. For the Occupant Load, a range of 3 to 7 SF per person has been used for a Level of Service D to C, which for this study has been assumed to be the highest range of platform congestion (American Public Transportation Association BRT Recommended Practice, October 2010).

The plan diagram below illustrates the platform area for passengers exclusive of areas used for furnishings, canopy structure and the tactile warning area. The 423 square feet (SF) will accommodate from 60 - 141 occupants based on the 3-7 SF metric per person.

PLATFORM PLAN - CAPACITY

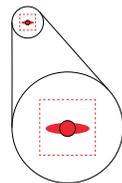


PLATFORM CAPACITY (TYPICAL)

Area: 423 SF
Occupant Load: 60-141

PLAN DIAGRAM KEY

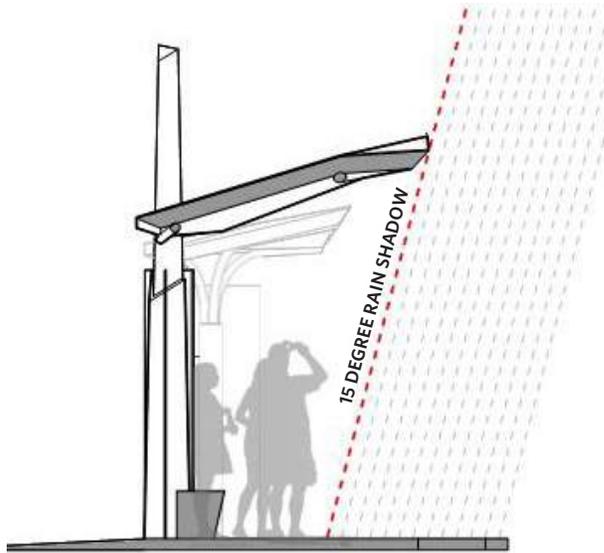
1 Person /
3 SF



Area
Represented
in Calculation



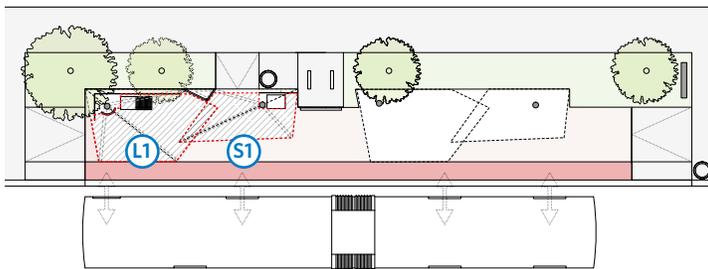
PROTOTYPE STATION SECTION - RAIN SHADOW DIAGRAM



CANOPY COVERAGE AND WEATHER PROTECTION

The plan diagrams below illustrate the platform area coverage by the potential range of canopies as defined by the shelter framework and the potential protection from rain, assuming a 15 degree rain shadow.

PLATFORM PLAN - CANOPY COVERAGE



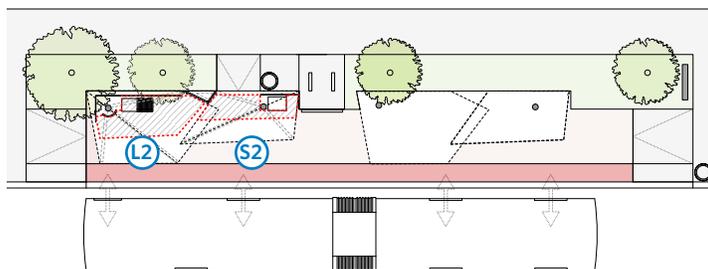
CANOPY COVERAGE:

Small Canopy (S1)
 Area: 50 SF
 Occupant Load: 7-16

Large Canopy (L1)
 Area: 78 SF
 Occupant Load: 11-26

Typical Shelter (S1 + L1)
Large + Small Canopy Together
 Area: 123 SF
 Occupant Load: 17-41

PLATFORM PLAN - CANOPY PROTECTION FROM RAIN



RAIN PROTECTION:

Small Canopy (S2)
 Area: 21 SF
 Occupant Load: 3-7

Large Canopy (L2)
 Area: 40 SF
 Occupant Load: 5-13

Typical Shelter: (S2 + L2)
Large + Small Canopy Together
 Area: 58 SF
 Occupant Load: 8-19

Two Shelters:
 Area: 116 SF
 Occupant Load: 16-38

↑ Direction of Rain (Worst Case Scenario) ↑

Prototype Station Test Fits

The Test Fits below illustrate how the Program of Requirements / Station Amenities (Page 2) and Station Framework (Page 6) may be implemented based on specific site context. The test fits illustrate an urban sidewalk station, suburban stations and a high capacity Park and Ride station.

URBAN MIXED-USE / CONSTRAINED CONDITIONS

US 29 - FENTON ST



STATION W/O SHELTER

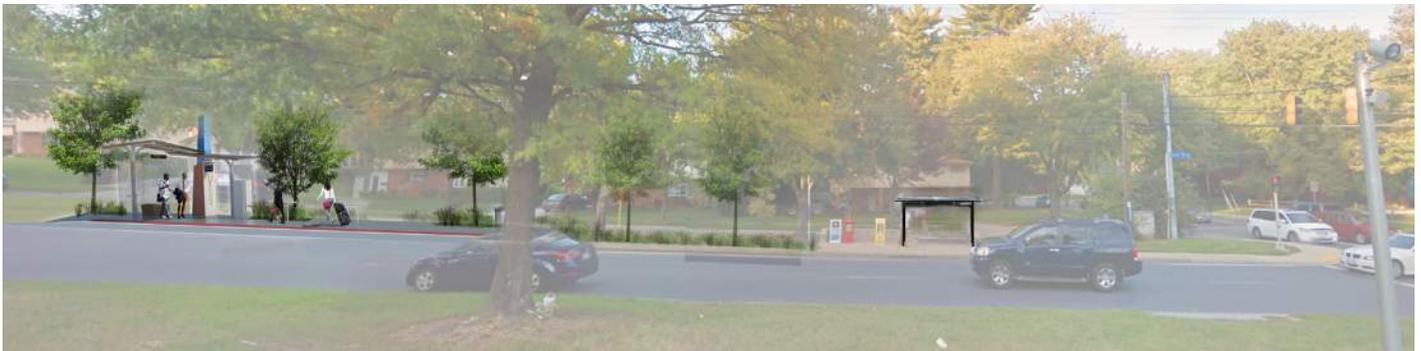


STATION W SHELTER



SUBURBAN RESIDENTIAL / SHARED BUS STOP

MD 586 - TWINBROOK



This test fit illustrates how a local bus station may be integrated with an adjacent BRT station.

The platforms for each bus stop type will be connected by a landscaped pedestrian connection while still accommodating a physical separation of the loading areas for each of the busses that is required to ensure operational efficiency for the BRT system.

SUBURBAN COMMERCIAL

MD 355 - WATKINS MILL ROAD



PARK & RIDE / HIGHEST CAPACITY

US 29 - BURTONSVILLE PARK & RIDE



Design Features

Landscape Design and Stormwater Management

APPROACH

The conceptual landscape approach for the BRT stations is to provide a sustainable, low maintenance, and native complement to the station architecture design. Softscape and hardscape elements will be chosen that meet these requirements and are responsive to the individual sites. These elements will come together in complement with the final shelter materials, to make an aesthetically pleasing kit of parts that will serve as one of the identifying features of the new line.

OPTIONS

The landscape elements will be integrated on a site by site basis due to the varying scales, conditions and site constraints. The elements will be flexible to assist in allowing commonality between all stations to address site specific issues that arise. As the different implementations of the station modules allow for flexibility and expansion, the landscape will respond accordingly. Landscape infill between modules, at the end of the platform, behind the shelter or in other locations is extremely flexible as long as the general palate is maintained, creating an overall cohesive and aesthetic standard.

In the urban/mixed use/restricted space context the landscape options are much more limited due to physical restraints. In these locations the station may be minimal and have no additional elements beyond the station marker. In other locations a simple solution will be used, adding a marker tree and a few additional plantings as permissible so as not to infringe upon general pedestrian circulation and urban streetscape function.

In the suburban/residential/open space applications, more space is available allowing for further landscape enhancements. The options within this context provides a great deal of variety from multiple trees, to enhanced plantings, Low Impact Development (LID) plantings, and other features. It is assumed that at a minimum, each station will receive marker trees flanking each end of the platform to identify the edges of the platform. As the different implementations of station modules are finalized at each location the addition of ornamental trees, and greenspaces will be included. The plant palate will be of similar species regardless of the size of the plantings to again create a commonality amongst stations. These stations also lend themselves well to a wide variety of other design possibilities including LID.

LOW IMPACT DEVELOPMENT (LID)

Where applicable and as space allows, LID treatments will be initiated at the stations. This could take the form of at grade recessed raingardens, or raised planters that receive the water, or other scenarios that are presented due to site conditions. In any case these elements would be coordinated with station materials to make a cohesive stop. The use of acceptable MCDOT plants that can survive both dry and inundated conditions will provide the proper environment and aesthetic at the facilities. These LID structures will serve as a way to treat stormwater and reduce overall site runoff. Water can be channeled from the sidewalk, the platform, the curb or from the shelter itself depending on how the specific grading for each site works. These elements, while serving an important function, can also offer exciting opportunities for public art or education on stormwater management practices. Ways of water conveyance from the shelter or other elements, or devices to show how stormwater is collected on site can further the mission of showing how the line strives to be environmentally friendly and sustainable.



LOW IMPACT DEVELOPMENT EXAMPLES

Top Image - Potential platform access improvements

Bottom Image - LID planters separating sidewalk from platform zone

PLANT SELECTION

The planting palate will be a common element that can be used along the BRT line, where space allows, that assists in creating an identifier for the line. Along with trees, a variety of shrubs, groundcovers, and grasses would be implemented to provide variety and interest at all the stations.

All plants listed below are consistent with the County approved list.

POSSIBLE MARKER TREES:

- *Nyssa sylvatica* - Blackgum
- *Ulmus parvifolia* - Lacebark Elm
- *Betula nigra* - River Birch (single stem)

POSSIBLE ORNAMENTAL TREES:

- *Amelanchier laevis* - Allegheny Serviceberry
- *Cercis canadensis* - Eastern Redbud
- *Cornus kousa* - Kousa Dogwood

POSSIBLE PLANT MATERIALS

Shrubs

- *Ceanothus americanus* - New Jersey Tea
- *Photinia pyrifolia* - Red Chokeberry

Groundcovers/Perennials

- *Asarum canadense* - Wild Ginger
- *Phlox divaricata* - Woodland Phlox
- *Tiarella cordifolia* - Foamflower

POSSIBLE LID PLANTINGS

Shrubs

- *Clethra alnifolia* - Summersweet Clethra
- *Itea virginica* 'Little Henry' - Virginia Sweetspire
- *Ilex glabra* 'Compacta' - Compact Inkberry Holly

GROUNDCOVERS/PERENNIALS

- *Chrysogonum virginianum* - Golden Knee
- *Geranium maculatum* - Wild Geranium
- *Phlox subulata* - Moss Phlox

HARDSCAPE ELEMENTS

In addition to the softscape elements on the project, the hardscape and site furnishings will serve a key role in the final aesthetic and function of the stations. Concrete paving will complement the surrounding context while providing visual indicators of the platform extents, as well as tactile indicators to the platform edge. The paving offers an opportunity for patterns and colors that can express the branding of the line, or of the local community.

Site benches, leaning rails, bike racks, trash cans, and other associated facilities will be placed as required to serve each station's capacity. In the more urban context less elements will be provided utilizing the streetscape elements already in place, with the intensity increasing as the stations move to the more suburban situations. In the non-urban situations multiple trash cans, benches and bike racks will be provided to service the need of the ridership.

All site furnishings will be a form and finish that is complementary with the final shelter design and marketing scheme for the BRT line, providing a consistency and integration among all elements. Where applicable, these elements also offer the opportunity for community input and creativity, providing a few unique features that represent the local community and context.

Design Features

Sustainability / Energy Production

PHOTOVOLTAICS

Depending on site location, station orientation and solar access, it is recommended that photovoltaics be incorporated in the canopy design to provide electrical energy for the station lighting and signage.

Depending on type of canopy used - solid panel or glass - either standard solar panels or building-integrated photovoltaics (BIPV) may be used. During the design development phase of each station, the capacity for energy production and energy usage (for LED lighting and potential heating element) should be evaluated and considered as part of the life-cycle cost exercise.

KINETIC PAVING

Currently, there are several companies developing pavers which produce kinetic energy when either pedestrians or vehicles travel over them. While there are no systems that currently produce energy at an acceptable return on investment, the technology may be successfully developed for future implementation of BRT lines and will be a consideration in initial planning.

PHOTOVOLTAIC EXAMPLES

Top Right - Boston Bus Station, Typical Solar Panel
Lower Right - Columbia Heights Plaza, DC, BIPV Panel



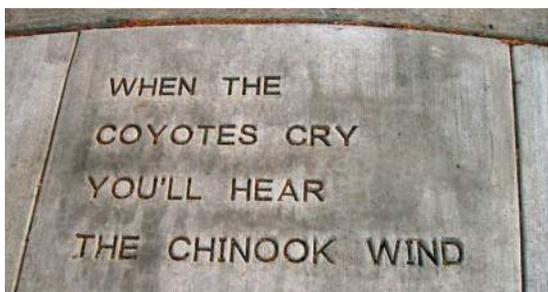
Public Art

OPPORTUNITIES

The incorporation of public art into the stations provides an opportunity to customize the stations for each site, encourage community stewardship, and has also been shown to reduce vandalism.

With the prototype station design providing the overall unifying architecture for the system identity, the following station components may be designed to incorporate public art:

- Windscreens
- Canopy Roof
- Seating
- Leaning Rails
- Paving
- Stand-alone Station Area Art Pieces



PUBLIC ART EXAMPLES

Top Left - Clockwise: Windscreens, Shelter Columns (Dallas), Shelter Glass Canopy Frit Pattern, Seating, Leaning Rail, Paving, Stand-Alone Station Area Art Feature (Portland)

Design Features

Branding

SYSTEM AND STATION IDENTIFICATION

The Branding for the Montgomery County BRT system shall be developed to include:

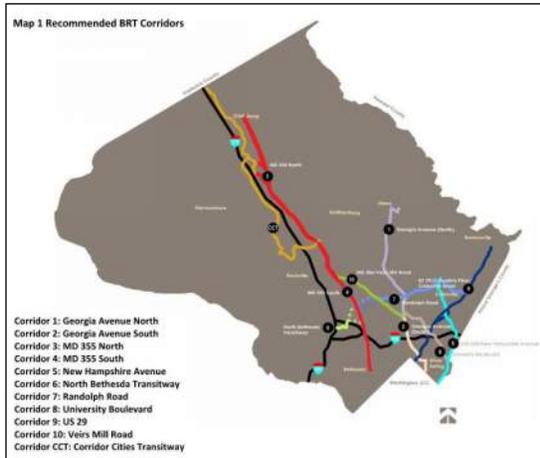
- System Identification, including System Maps and Logo for the Station Marker
- Line and Station Maps, potentially providing differentiation between BRT Lines and with ability to expand per implementation phasing plans.
- Station Identification including braille and on-demand verbal options for sight impaired patrons

To support Rider understanding of the BRT system within the regional transit system, it may be beneficial for the branding design to be developed as complementary to the WMATA system map. This could be a similar approach to the BRT Prototype Station Markers being developed as a companion to the WMATA Station Pylon - a similar design strategy to create an iconic feature, though each have their own identity.

In recognition of the County's diversity, some graphic cues may also be taken from other systems, such as the Mexico City Metro. The system signage was developed with graphic station icons in addition to station names to facilitate non-spanish and indigenous language speakers who would be using the system. If this approach is used, it may also provide an opportunity to identify and celebrate neighborhood features.

BRANDING ELEMENTS

- Top Right to Lower Right:
- Montgomery County BRT Master Plan Alignments
- WMATA System Map
- Mexico City Metro (Interior and Station Sigage) - Example of Iconic Station Names



Station Planning - Conceptual Budget Estimate

As noted previously, the cost for each station will vary depending on inclusion of station amenities and adaptation for each station site. The preliminary conceptual budget estimate below is intended to provide a planning level budget for the future design development of stations. For simplicity, the architecture and landscape architecture for a typical 65' station with either one or two shelters has been estimated.

Summary - Standard 65' Platform, Side Loading w/ Landscape

Item	Description	Unit	Measure	Unit Cost	Subtotal
Platform					
			Dimension		
Platform - Slab & Foundations	CIP Concrete	SF	11'x65'	715 \$ 40	\$ 28,600
Platform Ramp Access (Allowance)	CIP Concrete	SF	11'x25'	275 \$ 30	\$ 8,250
Tactile - ADA Pavers		SF	2'x65'	130 \$ 35	\$ 4,550
Trees/LID/Landscape	4 Trees + Landcape Tree Well	SF	4'x85'	340 \$ 50	\$ 17,000
Station Area Furnishings					
Marker (1)	Metal, Stone, Lighting, Signage	Unit	Each		\$ 30,000
Canopy & Structure (1 Pair - 1 large + 1 small)	Roof Area - Approx 125 sf, Lighting	Unit	Each		\$ 110,000
Windscreen	Metal Frame, Tempered Glass	LF	20'x8'	20 \$ 600	\$ 12,000
Seating	Stone/Precast	LF	10	10 \$ 300	\$ 3,000
Leaning Rail	Ptd Metal	LF	10	10 \$ 150	\$ 1,500
Waste/Recycle	Montgomery County Standard	Unit	2	2 \$ 1,200	\$ 2,400
Bike Racks	Montgomery County Standard	Unit	3	3 \$ 400	\$ 1,200
Public Art					
Integrated Approach	Allowance per Station				\$ 50,000
Communications and Power					
Ticket Vending Machine				Allowance	\$ 25,000
Real Time Signage				Allowance	\$ 25,000
Utility Grid Power + Circuit Panels	Will Be Site Specific			Allowance	\$ 50,000
Station Development - 1 Canopy Pair + Windscreens					\$ 368,500
Station Development - 2 Canopies + Windscreens					\$ 490,500
Potential Policy Decisions / Add Alternates					
CCTV	TBD	Unit			TBD
Shelter Canopy Heating	TBD	Unit			TBD
Sustainability - PV Panels / Energy Offset	TBD	Unit			TBD

APPENDIX

STUDY PROCESS EXHIBITS

WORKSHOPS AND OPEN HOUSES :: July 2017



Montgomery County Bus Rapid Transit Design MwCOG TLC Grant

Project Kick-off - Agenda 10.31.16

- Introductions
- MwCOG Project Scope - Overview
- MCDOT - US 29 Project Scope - Overview
- Coordination of Two Projects
 - Schedule
 - Project Meetings
 - Stakeholder Involvement
 - Deliverables
- Draft Outline of Prototype Design Parameters - Discussion
- Additional Items and Next Steps



Meeting Notes

Date May 17, 2017
 Project No. D23480
 Project Name MWCOG – Mont. County
BRT Design
 Page No. 1

Meeting Time & Location MWCOG TLC Grant Kick-Off Meeting
 11am-12:30pm, October 31, 2016, Montgomery County Executive Office Building, 10th Fl.
 From ZGF

Meeting Attendees:

Joana Conklin	joana.conklin@montgomerycountymd.gov	MCDOT
Rafael Olarte	rafael.olarte@montgomerycountymd.gov	MCDOT
Darcy Buckley	darcy.buckley@montgomerycountymd.gov	MCDOT
Gary Erenrich	gary.erenrich@montgomerycountymd.gov	MCDOT
John Swanson	jswanson@mwco.org	MWCOG / TPB
Rick Kiegel	rkiegel@rkk.com	RK&K
Denise Watkins	dwatkins@rkk.com	RK&K

MWCOG Consultant Team

Otto Condon	otto.condon@zgf.com	ZGF
Chris Somma	christopher.somma@zgf.com	ZGF
Craig Atkins	catkins@wilesmensch.com	Wiles Mensch

Meeting Agenda:

1. Introductions
2. MWCOG Project Scope – Overview
3. MCDOT - US 29 Project Scope – Overview
4. Coordination of Two Projects
 - 4.1. Schedule
 - 4.2. Project Meetings
 - 4.3. Stakeholder Involvement
 - 4.4. Deliverables
5. Draft Outline of Prototype Design Parameters - Discussion
6. Additional Items and Next Steps

Meeting Summary:

The following summary is intended to highlight key discussion items for use in guiding the direction of the study, rather than a detailed documentation of the meeting.

Introductions



Meeting Notes

Date May 17, 2017

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design

Page No. 2

Grant Overview: by John Swanson.

Project Timeline: June 30th absolute due date for final deliverable for funding.

Project Scope of Work:

- ZGF explained how the MWCOG and the US29 projects will run parallel for workshops and pin-ups
- Workshops may be organized to dedicate first hour to Grant-related work, with second hour used for US 29 specific work.

Project Schedule:

- General consensus on Project Schedule and related deliverables – Attached Schedule has been updated to reflect Workshop 1 on Dec 16th.
- Project Webinars:
 - o This is a flexible item within the scope to be confirmed at a later date. The webinars may be done with CAC members, or may have in-person meetings with CAC members.
- Stakeholders:
 - o will include WMATA, City reps (Gaithersburg, Rockville), MTA,

Review of Preliminary Design Parameters - Comments:

- o Note: Attached Preliminary Design Parameters Summary has been updated to incorporate comments.
- o Station Design goals:
 - Add Operations – add efficient operation for bus operator – ease of entry, fare collection for bus operator, how people move through the process and interact
 - Integrate/consider influence of local bus services, although will not use these stations.
- o Critical Design Parameters:
 - Discussion on the articulated bus, procurement and fuel types.
 - Issues with CNG esp. for low floor busses and entering enclosed stations
 - Made in America required for US 29 in order to use federal funds – only 2 vendors for US BRT buses – resulting in limited options (currently no electric BRT option)
 - Same corridors might have 40' buses – but must design for 60-65'
 - If we design to be flexible for electric buses in the future – must design with additional parameters
 - team should not 'over design' the stations to accept all fuel types, although we should identify differentiating aspects of each and how that may affect station design early in the process



Meeting Notes

Date May 17, 2017

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design

Page No. 3

- Vehicle floor height – identify issues with curb height and the variable deck height of bus based on loading – should be designed for lower curbs and potential hydraulic kneeling of bus.
- Operations and maintenance issues
 - Life cycle costs – for station (materials and for vehicles)
 - Identify long term maintenance, trash pick-up, snow removal, protection from splash
 - Storm water management opportunities should be identified
- Missing Parameter: Safety
 - Cameras? Connection to network? CCTV?
 - Emergency push button? – is there a need if everyone had a phone?
 - Lighting
 - Important for sense of safety
 - Must ensure not to affect adjacent buildings and occupancies.
 - Types, locations of conduits, need to be considered
 - Design for evacuation may depend on platform layout.
- Agencies that need to be involved and to what capacity?
 - Police department
 - Parks and planning
- Peer Review - Arlington has constructed modular kit of parts – should they be invited for input at a specific stage?

Montgomery County Bus Rapid Transit Design

Project Schedule and Coordination - DRAFT FOR CLIENT REVIEW / 10.31.16



MWCOG - Montgomery County BRT Station Prototype Design ZGF PROJECT 023480

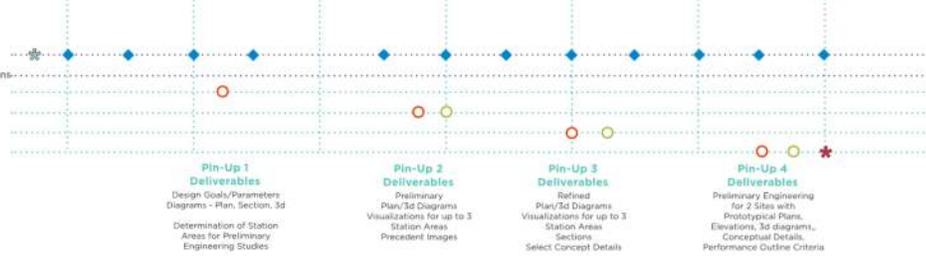
- Task 1 - Project Initiation
- Kick-off Meeting & Project PM Meetings
- Workshop 1 / Webinar 1
- Task 2 - Program Requirements Draft
- Workshop 2 / Webinar 2
- Task 3 - Recommended Station Prototype
- Workshop 3 / Webinar 3



- Kick-off Meeting
- MCDOT Workshops
- Progress Mts/Conference Calls
- CAC Webinars
- Final Submission

US29 BRT Design ZGF PROJECT 023616

- Task 1 - Project Development
- Task 2 - Architectural Concepts / Station Plans
- Design Parameters and Goals
- Preliminary Prototype Concepts
- Refined Prototype Concepts
- Preferred Prototype Concept Design



- Kick-off Meeting
- MCDOT Pin-Up Meetings
- Design Team Progress Meetings
- Coordination Meetings
- Final Submission

Montgomery County Bus Rapid Transit Design

Station Prototype - Preliminary Design Parameters Summary



<p>Project Goals</p> <ul style="list-style-type: none"> Design with interchangeable components and flexible enough to apply to all three corridors ? 	<p>Critical Design Parameters</p> <ul style="list-style-type: none"> Bus Length - 60' Articulated Doors on Both Sides of Bus ADA Accessibility - Low Floor Vehicle - 10" or 14" - will influence integration and length of platforms System Compatibility - Platform Sharing? Fuel Type? - CNG/Electric Made in America requirements ? 	<p>Station Definition</p> <p>Alignment/Platform Types</p> <ul style="list-style-type: none"> Center Loading Side Loading Near and Far Side Center Offset Access - Single End, Both Ends, Along Edge of Platform <p>Station Type</p> <ul style="list-style-type: none"> Urban Mixed-Use Suburban Arterial Commercial/Residential <p>Station Volume & Use</p> <ul style="list-style-type: none"> Length - Single or Stacking Volume - High or Low Primarily Loading / AM Direction Primarily Unloading / PM Direction Headways 		<p>Identity, Wayfinding, Branding</p> <ul style="list-style-type: none"> Station Visibility/Prominence Alignment Identification <p>Station Amenities</p> <ul style="list-style-type: none"> Weather Protection - Canopy and Wind Screens Lighting Climate - Heat? Waiting - Seating, Leaning Rail Off-board Fare Collection Real Time Signage Landscape Bike Facilities Wifi access? Public Art <p>Sustainability</p> <ul style="list-style-type: none"> Stormwater Management Alternative Energy - PV 	<p>Station Adaptability</p> <ul style="list-style-type: none"> Canopy Scalability Modularity for Furnishings Wind Screen - Microclimate Flexibility Identity for Separate Corridors
<p>Station Design Goals</p> <ul style="list-style-type: none"> Rider Comfort and Ease of Use - At Arrival and During Wait ? 					<p>Station Area Access Related Improvements</p> <ul style="list-style-type: none"> Walk Up Kiss & Ride Park & Ride



Montgomery County Bus Rapid Transit Station Prototype Design MWCOG TLC Grant

Agenda: Workshop 1, December 16, 2016, 10am-Noon
EOB, 9th Floor Large Conference Room, 101 Monroe St, Rockville

- Introductions
- MWCOG Grant - Project Overview
 - Stakeholders - Advisory Role
 - Project Schedule
 - Design Goals
 - Prototype Evaluation Criteria
- Three Corridors - MD 355, MD 586, US 29
 - Station Area Contexts
 - Transit - Metro/Park & Ride
 - Civic/Institutional
 - Park
 - Suburban Residential
 - Suburban Commercial
 - Urban Mixed-Use
- Bus Rapid Transit Vehicles - Design Criteria
- Alignments and Stations
 - Platforms - Horizontal Requirements
 - Minimum Platform Requirements & Adjacent Improvements (LID Stormwater, Access)
 - Side Loading Platforms
 - Center Loading Platforms
 - Vertical Elements
 - "Marker" Station Elements & Potential Expansion
 - Furnishings and Amenities
- General Discussion, Questions and Next Steps



Meeting Notes

Date May 17, 2017 -DRAFT

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design – Workshop 1

Page No. 1

Meeting Time & Location MWCOG TLC / MCDOT BRT Station Prototype Design – Workshop 1
10am-Noon, December 16th, 2016, Montgomery County Executive Office Building, 9th Fl.
From ZGF

Meeting Agenda: See Attached
Meeting Attendees: See Attached
Meeting Exhibits: See Attached Photos, and Exhibit Board PDF
To: MCDOT Client Group and Meeting Attendees

Meeting Summary: The following summary is intended to highlight key discussion items of the workshop.

Introductions

TLC Grant and BRT Project Overview: John Swanson, MWCOG, and Joana Conklin, MCDOT

Alignment Summary:

- US29 – First implementation, 2020 target
- 586 - East/West Connection
- 355 – Clarksburg-Bethesda, mirrors Redline
 - Ranges from a 6 lane arterial to a 2 lane rural
 - Ride-on Express on 355 may be upgraded as BRT implementation

The following is a summary of the comments and mark-ups of the Exhibit Board Discussion:

Issues to be considered:

- Integration with local bus system, how are / will Ride-on facilities be upgraded, identify policy driven impacts versus physical design considerations
- Complete system should work together
- Clarify County and City of Rockville ownership issues

Station Design Goals

- Scalable, and modular important to address
- Information experience and wayfinding experience
- Accessibility and multi-modal transportation
- Context and modular systems – how the site conditions (urban vs suburban) can influence a series of a modular elements
- Allow for evolving context
- Landscape as a modular element to make a better pedestrian experience
- Landscape as an amenity – may be willing to install larger stations if the landscape and curb appeal provides a neighborhood amenity
- Minimize ROW impact



Meeting Notes

Date May 17, 2017 -DRAFT

Project No. D23480

Project Name MFCOG – Mont. County

BRT Design – Workshop 1

Page No. 2

Design Parameters

- High visibility is critical
- Battery buses should be considered, not diesel. Consider incorporating charging.
- 10" curb is preferred. 14" curbs can't share with other bus systems and it makes the ramps very long.
- Consider on-street parking and driveways when locating the stations.
- Consider how weather protection is handled in urban installment versus by adjacent development, and how to minimize impact to pedestrian thru-put on streets
- Limit right of way impact vs. adding landscape for amenity space.
- Solar opportunities?
- Inform decision on Near Side versus Far Side platform considerations
- Incorporate minimum/similar branding for platforms which may be either predominantly boarding and deboarding platforms

Minimum Station Parameters

- Wayfinding – provide bold signage i.e. "BRT pay HERE, not on the bus"
- Contextual wayfinding – provide wayfinding for context-specific locations, i.e. trail map in residential areas, campus maps for institutional, etc
- Wayfinding defined by colors – use colors to complement branding and wayfinding
- Center Platforms - Bike racks – provide a lot of bike parking for multi-modal transportation
 - Do not locate racks on platforms. Locate behind the station.
 - Consider lockers/bike share at site-specific locations. Lockers and bike share are large amenities and unlikely to have adequate space.
 - Investigate the general demand for bike parking vs ridership
- Tree pits – coordinate with utilities and overhead lines
- Trees – Consider sun studies to determine microclimates created by sun/shade. Providing both sunny and shady areas for pedestrians.
- Consider weather protection vs. landscape amenity space
- Consider landscaping as a neighborhood stewardship - community garden, bioretention
- Stormwater management
 - Per Arlington and Alexandria, stormwater and LID elements are not required but offers an additional amenity. Alexandria had LID elements but Arlington did not.
 - Consider locating LID elements at the back of the station and leaving the front of the station pedestrian-friendly.

Concluding remarks:

- Workshop 2 will include a review of potential stations concepts, with visualizations and precedent examples



Meeting Notes

Date May 17, 2017 -DRAFT

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design – Workshop 1

Page No. 3

Meeting Exhibits (also refer to separate pdf of boards):



MCDOT BRT PROTOTYPES

MD355, MD586, US29

Project Overview

- Produce a prototype station design to inform planning and design for the proposed Bus Rapid Transit Corridors.
- Develop prototype designs with the core and secondary components that will be adaptable for all corridors.

Project Schedule / Deliverables

- Workshop 1 (Dec '16): Design Goals, Parameters, Best Practices
- Workshop 2 (Feb '17): Design Concepts, Test Visualizations
- Workshop 3 (Mar '17): Prototype Design, 2 Station Exterior

STATION DESIGN GOALS

- Design stations to improve *pedestrian, wheelchair, and stroller* access.
- Improve *experience and comfort* (seating, shelter, weather protection).
- Base of Use: *transit-oriented development*.
- Arrival & Waiting: *accessibility, shelter, and information*.
- Design stations to fit & enhance context (form & sustainability).

Operations & Maintenance Goals

- Design to support efficient BRT and *local bus* operations (from vehicle maneuvering to fare collection).
- Design to consider *operational* (access, maintenance, cleaning, snow removal) and *investment* (life cycle costs).

Evaluation Criteria

- Identify Flexibility, Adaptability
- Operations
- Cost - Capital and Life Cycle

Visual Alternatives

STATION AREAS

Context & Potential Test Sites

MD355 MD586 US29

Station Site Types

Station Site Type	MD355	MD586	US29
Transit Park & Ride	1	2	3
Suburban Residential	1	2	3
Park / Open Space	2	1	1
Urban Mid-rise	1	1	1

RAPID BUS VEHICLES

Vehicle Design Criteria / Influences

Design Parameters / Assumptions

- Length - Articulated
- Floor Location - High Floor
- Accessibility - Fully Accessible
- Wheelchair - Low Floor, 3rd Curbside
- System Compatibility & Potential Platform Sharing (with existing operations)
- Platform Location / Designing Features: *shelter, seating*

Potential Bus - Articulated, 3 or 4 door

Standard Bus - Comparison

Bus Platform / Curb Height & Transition Ramp



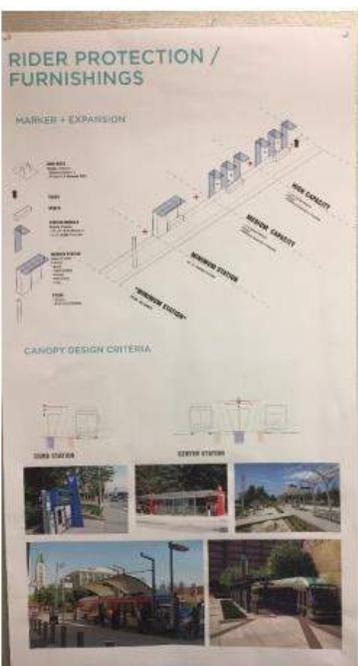
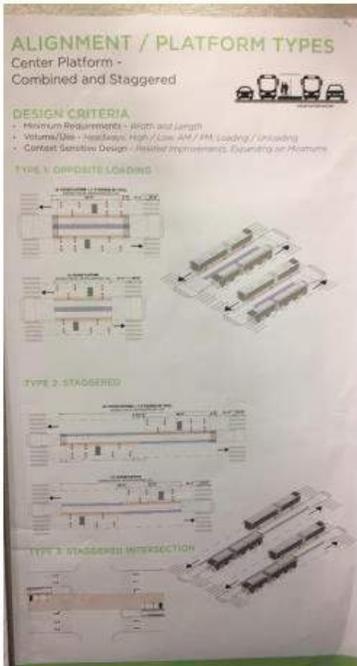
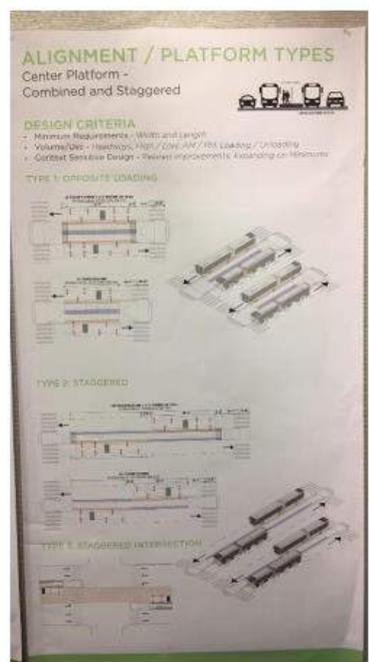
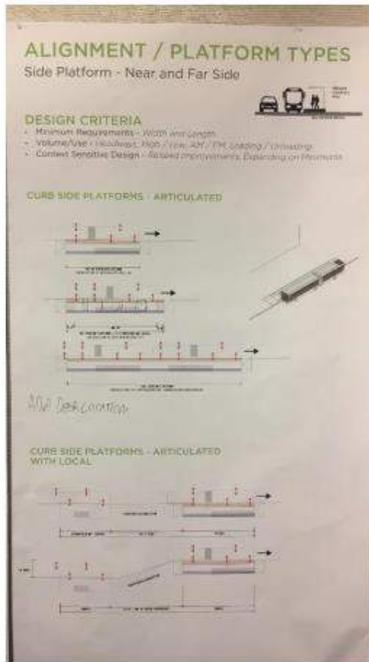
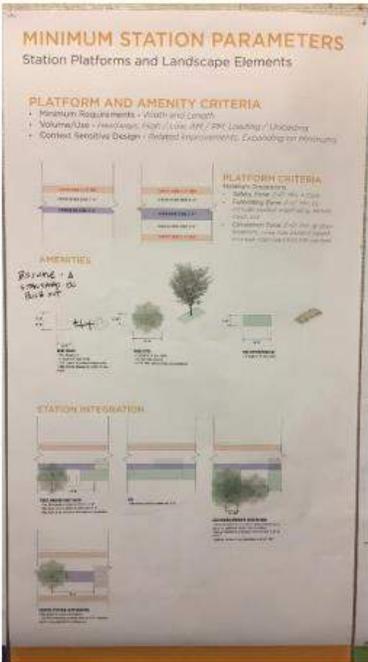
Meeting Notes

Date May 17, 2017 -DRAFT

Project No. D23480

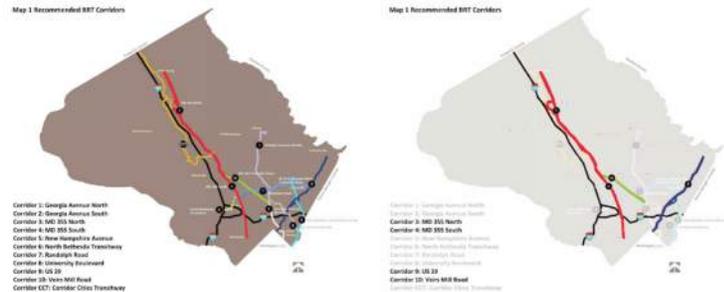
Project Name MWCOG – Mont. County
BRT Design – Workshop 1

Page No. 4



MCDOT BRT PROTOTYPES

MD355, MD586, US29



Project Overview

- Produce a prototype station design to inform planning and design for the proposed Bus Rapid Transit Corridors
- Develop a Prototype Design with interchangeable, modular components, that will be adaptable for all corridors

Project Schedule / Deliverables

- Workshop 1 (Dec '16): Design Goals, Parameters, Best Practices
- Workshop 2 (Feb '17): Design Concepts, Test Visualizations
- Workshop 3 (Mar '17): Prototype Design, 2 Station Examples

Station Design Goals

- Design Stations to Improve:
 - Rider Experience and Comfort (*aesthetics, safety, weather protection*)
 - Ease of Use (*wayfinding/branding*),
 - Arrival & Waiting (*accessibility, amenities and information*)
- Design Stations to fit & enhance context (*scale & sustainability/ stormwater*)
- ?

Operations & Maintenance Goals

- Design to support efficient BRT and local bus Operations (*from vehicle maneuvering to fare collection*)
- Design to consider operations (*utilities*), maintenance (*cleaning, snow removal*) and investment (*life cycle costs*)
- ?

Evaluation Criteria

- Identity, Flexibility, Adaptability
- Operations
- Cost - Capital and Life-Cycle

STATION AREAS

Context & Potential Test Sites

MD355



MD586



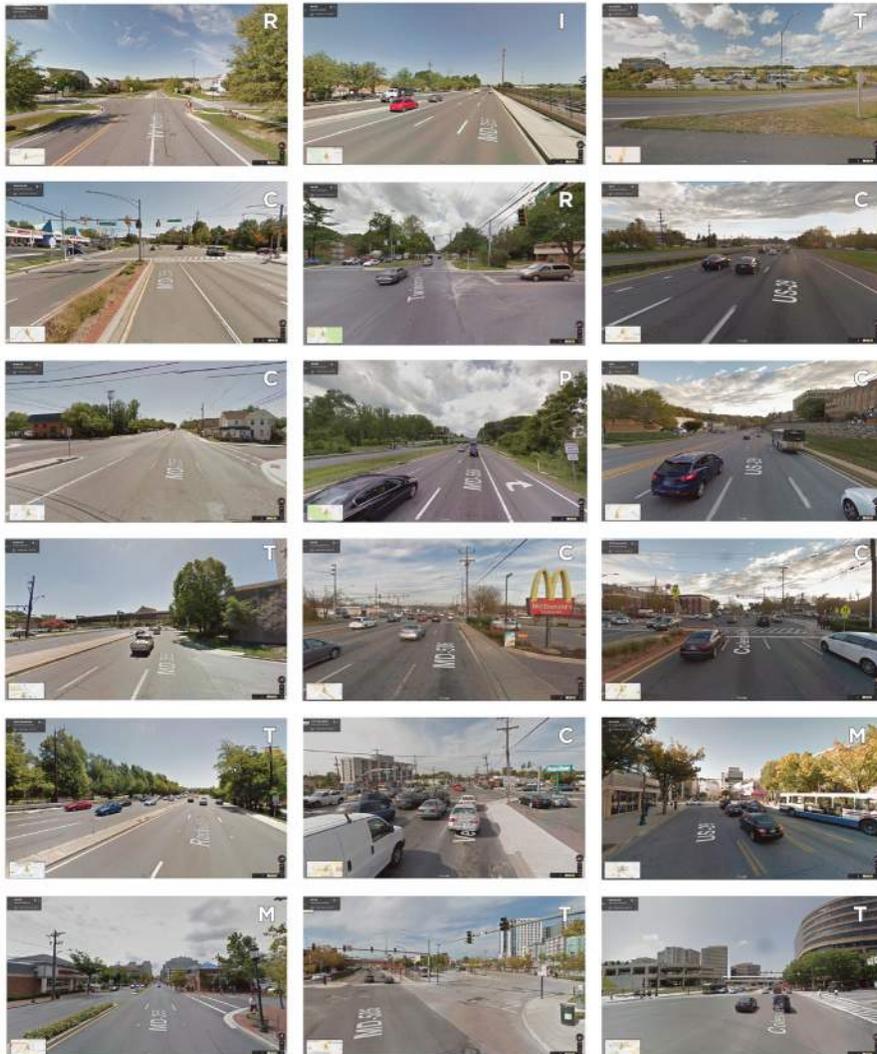
US29



Station Site Types:

Transit - Metro/Park & Ride
Institutional / Civic
Park / Open Space

T (9)	Suburban Residential	R (15)
I (3)	Suburban Commercial	C (16)
P (1)	Urban Mixed-Use	M (4)



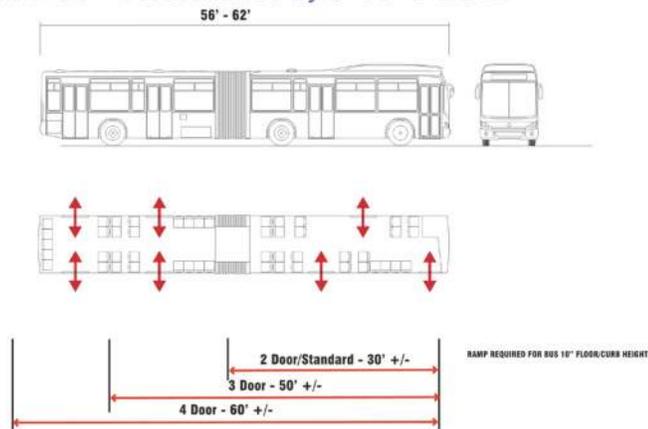
RAPID BUS VEHICLES

Vehicle Design Criteria / Influences

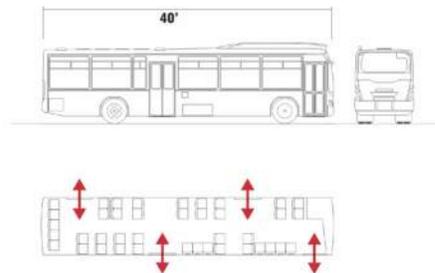
Design Parameters / Assumptions

- Length - Articulated
- Door Locations - Both Sides
- Accessibility - Fully Accessible
- Vehicle - Low Floor, 10" Curb Height
- System Compatibility & Potential Platform Sharing (w/o impeding operations)
- Fueling Issues / Distinguishing Factors?
- ?

Potential Bus - Articulated, 3 or 4 door

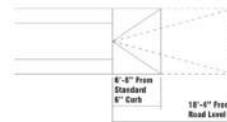


Standard Bus - Comparison

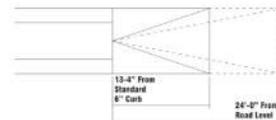


Bus Platform / Curb Height & Transition Ramp

10" Low Floor Bus Platform Ramp Transition



14" Low Floor Bus Platform Ramp Transition

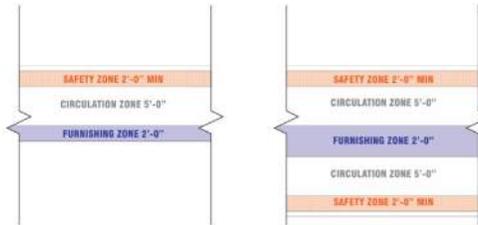


MINIMUM STATION PARAMETERS

Station Platforms and Landscape Elements

PLATFORM AND AMENITY CRITERIA

- Minimum Requirements - *Width and Length*
- Volume/Use - *Headways, High / Low, AM / PM, Loading / Unloading*
- Context Sensitive Design - *Related Improvements, Expanding on Minimums*

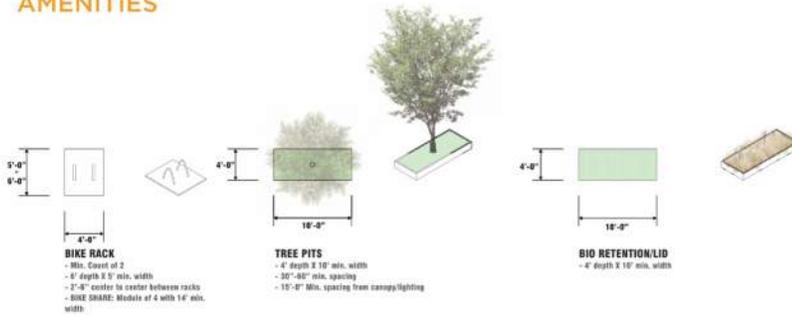


PLATFORM CRITERIA

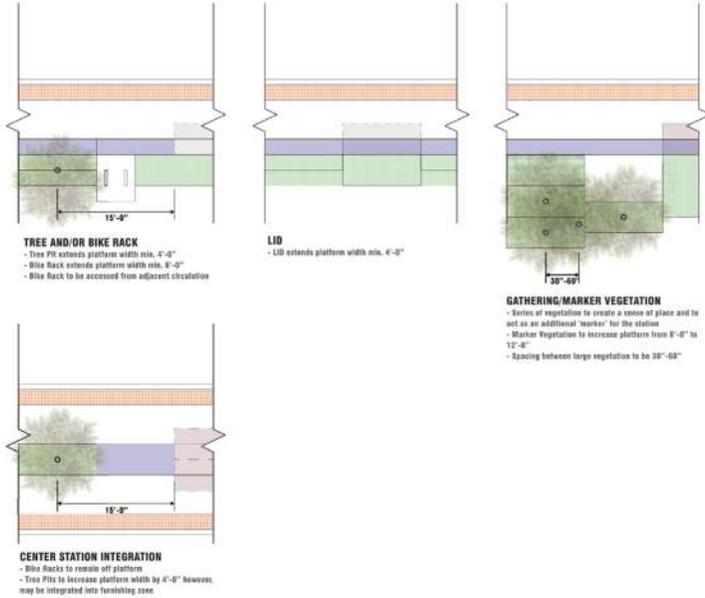
Minimum Dimensions

- Safety Zone: 2'-0" Min. + Curb
- Furnishing Zone: 2'-0" Min. to include: shelter, wayfinding, bench, trash, ect.
- Circulation Zone: 5'-0" Min. at door locations. Area may expand based on peak rider load and site context

AMENITIES



STATION INTEGRATION



ALIGNMENT / PLATFORM TYPES

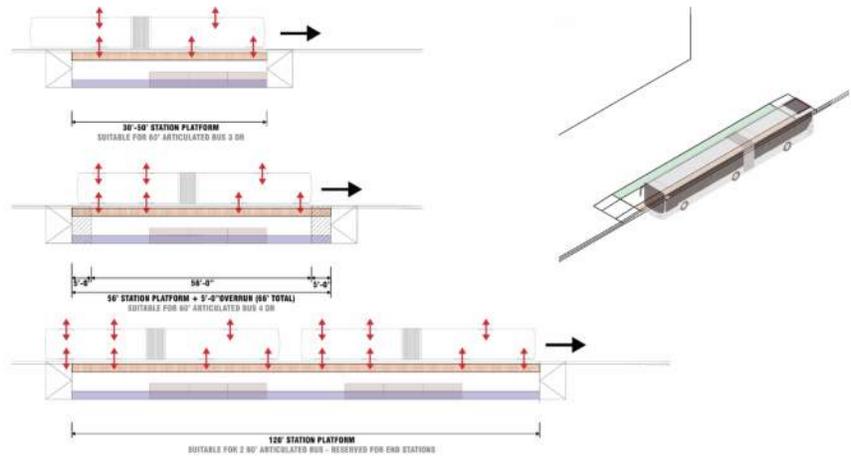
Side Platform - Near and Far Side



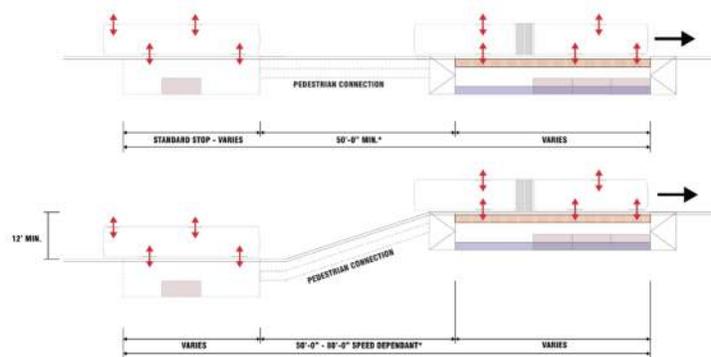
DESIGN CRITERIA

- Minimum Requirements - *Width and Length*
- Volume/Use - *Headways, High / Low, AM / PM, Loading / Unloading*
- Context Sensitive Design - *Related Improvements, Expanding on Minimums*

CURB SIDE PLATFORMS - ARTICULATED



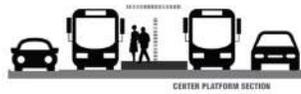
CURB SIDE PLATFORMS - ARTICULATED WITH LOCAL



*Data From: MET BUS RAPID TRANSIT SERVICE DESIGN GUIDELINES, VNY TRANSIT SUSTAINABILITY POLICY 2007

ALIGNMENT / PLATFORM TYPES

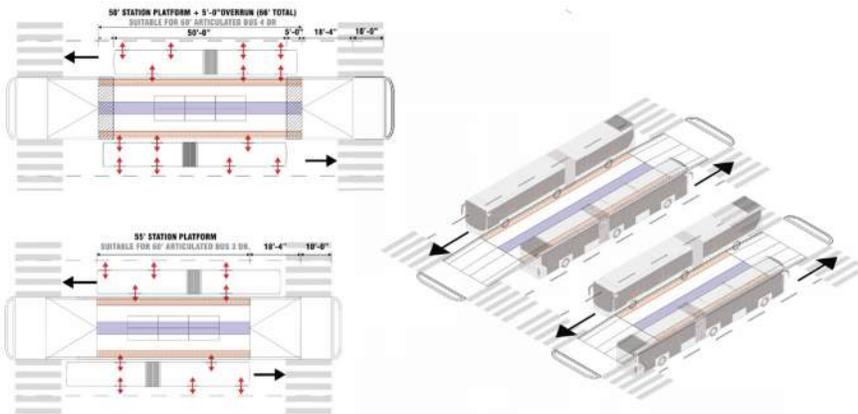
Center Platform -
Combined and Staggered



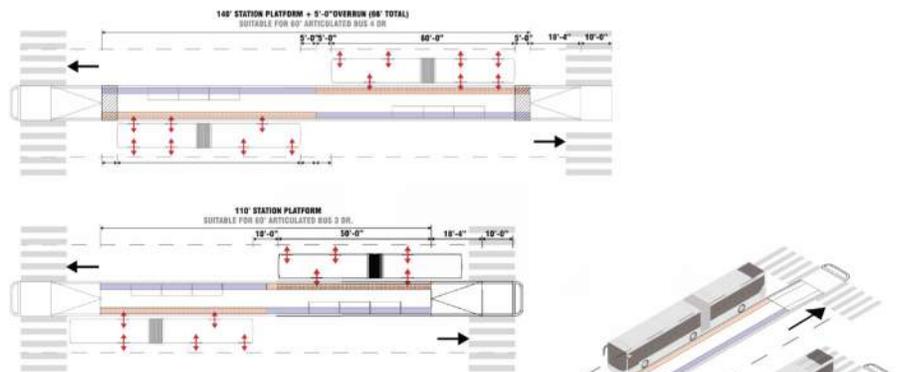
DESIGN CRITERIA

- Minimum Requirements - *Width and Length*
- Volume/Use - *Headways, High / Low, AM / PM, Loading / Unloading*
- Context Sensitive Design - *Related Improvements, Expanding on Minimums*

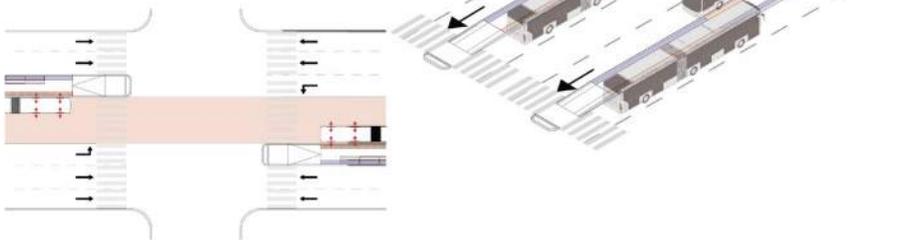
TYPE 1: OPPOSITE LOADING



TYPE 2: STAGGERED

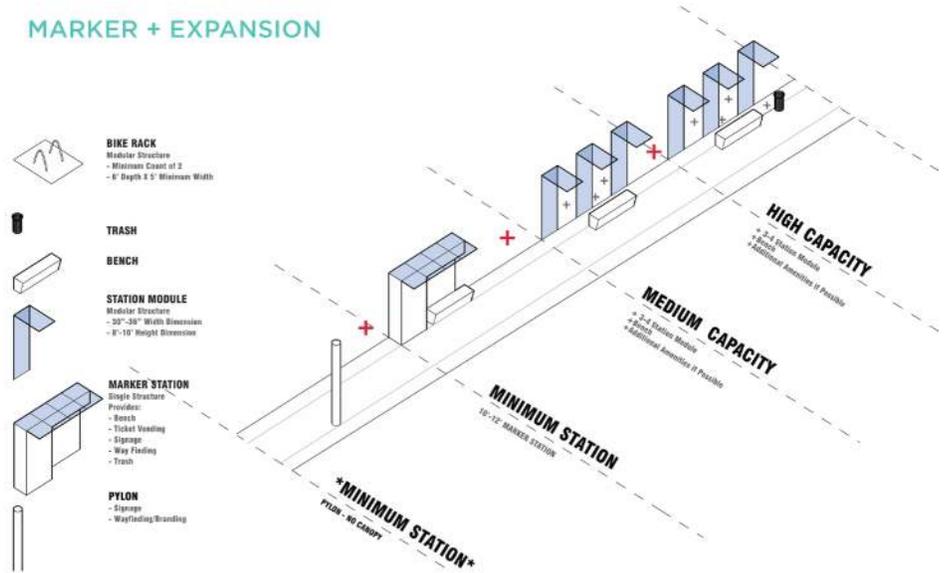


TYPE 3: STAGGERED INTERSECTION

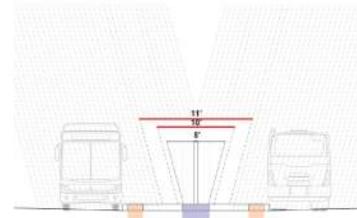
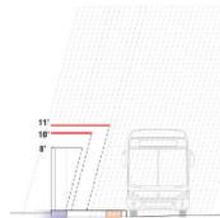


RIDER PROTECTION / FURNISHINGS

MARKER + EXPANSION



CANOPY DESIGN CRITERIA





Montgomery County Bus Rapid Transit Station Prototype Design MwCOG TLC Grant

Agenda: Workshop 2, February 21, 2017, 1 - 3 PM
EOB, 9th Floor Large Conference Room, 101 Monroe St, Rockville

- Introductions
- Workshop #1 - Refresh
- MD 355 Public Open House Summary
- Prototype Station Concepts - Discussion
 - Examples
 - Design Influences / Themes
 - Station Program of Requirements - Capacity and Context
 - Conceptual Framework
 - Station Shelter - Form Studies
- General Discussion, Questions and Next Steps
 - Workshop #3, to be scheduled



Meeting Notes

Date May 17, 2017 -DRAFT

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design – Workshop 2

Page No. 1

Meeting Time & Location MWCOG TLC / MCDOT BRT Station Prototype Design – Workshop 2
1-3PM, February 21, 2017, Montgomery County Executive Office Building, 9th Fl.
From ZGF

Meeting Agenda: See Attached
Meeting Attendees: See Attached
Meeting Exhibits: Refer to Exhibit Board PDFs, previously sent
To: MCDOT Client Group and Meeting Attendees

Meeting Summary: The following summary is intended to highlight key discussion items of the workshop.

Introductions

Public Open Houses – MD355, Veirs Mill Road and US 29 – Overview by Joana Conklin

Exhibit Presentation

ZGF (Otto) reviewed the previous workshop materials as an intro for Workshop 2.

- Generally discussed the precedent images representing BRT/station designs around the world
 - Outlined key characteristics for the stakeholders to consider as design elements, including scale, transparency and materials in relation to context. Weather mitigations strategy also reviewed.
 - Discussed take-aways from the local public meetings : word cloud (key words: Green, Technology, Innovative, Diverse)
 - Otto discussed some research that has been done about Montgomery county to inform design and materials, specifically looking at natural resources or stone from quarries quarries of the past
- Discussed programmatic elements to be evaluated as design evolves.
- Station and platform framework: Discussed how the marker will need to be adapted to specific contexts as well as capacity. This included concepts from tight urban contexts (simply pylon marker) to the suburban residential and urban (additional elements/shelter). This also ties into the landscape strategy and how to respond to specific context. Goal is to make landscape a key feature for the stations identity.
 - Presented the differences b/w expansion and repetition and how that can alter how the design is developed, highlighting advantages and disadvantages of both and how landscape will be incorporated:
 - Discussion on how either option will achieve station identity, including:
 - How expansion will have a larger cohesive framework and large presence;
 - Repetition allows for full use of platform and ability to integrate landscape throughout from day 1 – which can help with station identity.
 - Repetition will help in spreading riders across the platforms to avoid congestion at one door.
- ZGF (Chris, Adam) presented 4 archetypes/typologies that have been developed. There may be a hybridization of ideas for the final prototype. These four include:



Meeting Notes

Date May 17, 2017 -DRAFT

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design – Workshop 2

Page No. 2

- Plains, Facet, Uplift, Sail
 - Each of which show the different iterations from marker to expansion + repetition.
 - Team explained how these don't necessarily represent the materiality of solid vs. void but a starting point for potential iterations and development and initial feedback.
 - Landscape: Wiles Mensch (Craig, Sara) discussed landscape strategy briefly based on expansion or repetition and introduced the idea of collecting water for LID etc.

Group Discussion – Comments and Questions

1. General Design Comments

- a. More "OOPMPH" needed for designs.
- b. Need to be able to market as a 'station' and not just another bus shelter
- c. Supportive comments on the repeated columns or 'colonnade' that help create a sense of presence while still allowing the platform to be 'free'
- d. Plains seems too 'flat' and will block views?
- e. Will need to keep shelter edge pulled back from face of curb due to SHA requirements. Must consider the rain shadow issue.

2. Station vs Shelter

- a. Amenities, look, feel, comfort.
 - i. Maps: can the maps be interactive – can they be in the glass to help with transparency can provide mapping – can it just be a graphic object?
 - ii. Suggested to incorporate a "live map".
- b. Heating/cooling
 - i. Concern over weather extreme conditions – too cold in winter, too hot in summer
 - ii. Shade is a requirement
 - iii. Heating was discussed – there is concern over maintenance, cost, and whether it is necessary – longest wait at peak is 7 mins and off peak 15 mins.... Average much shorter than that. Comment that- 7-15 mins is enough for someone to get into their car if they will be uncomfortable at stop
- c. Data
 - i. What information are we showing for the system:
 1. Map with bus schedule
 2. Real time arrival: BRT and Local both shown?
- d. Tech
 - i. Real time – where will it be mounted? Must be visible everywhere. Look at European examples.
 - ii. Wifi – inclusion will be a policy issue
 - iii. Phone charging – also a policy discussion

3. Weather protection



Meeting Notes

Date May 17, 2017 -DRAFT

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design – Workshop 2

Page No. 3

- a. Roof
 - i. Slope needs to consider drainage
 - ii. Coverage to bus door? What is required, what are our limits?
 - iii. Considering rain shadow - how to get presence while not hindering occupant comfort and diminishing shadow?
- b. Windscreens
 - i. Seems to be very important for the winter months to block the wind, but cannot block breezes in the summer. How to mitigate between winter and summer?
 - 1. Moveable windscreens? louvers? Adjustability to micro climates?
 - 2. Design to specific micro climates (static approach)?
- 4. Safety**
 - a. Visibility of occupants from all angles is critical, and there is a concern that too much or the incorrect landscape can hinder this as well as too many solid surfaces at the ground level.
- 5. Materials**
 - a. There were some concerns about heavier materials (stone as the local precedent) due to maintenance, cost, and availability.
 - b. Proportion and scale of materials for maintenance and replacement (ie glass panels) should be considered.
 - c. Wood as a primary material can be a positive draw (looked back to the precedent from Raleigh).
- 6. Bike storage**
 - a. Must have bike storage somehow.
 - b. Nice to be under a complimentary shelter.
 - c. Not on platform of actual shelter – maybe from rear off the side or in transition zone to local stop.
- 7. Advertisement**
 - a. Inclusion will be a policy issue, revenue may be evaluated. It is worth it?
 - b. Ad panels create visibility concerns for users.
 - c. Idea to not include in actual design for shelter but as a different element since this decision may be made at a later date.
- 8. Modularity?** Definition – may refer to both fabrication and future growth.
- 9. Neighborhood representation**
 - a. Public Art opportunities should be identified – paving, windscreens, seating, landscape, maps
 - b. Reflection of neighborhood identity in the shelter design may be considered.
 - c. Naming of station should be considered.
- 10. Local vs. BRT stops**
 - a. Similarity or separation?
 - b. Is there a way that the local can share the platform with a BRT without disrupting service? Will local of off board fare in time?



Meeting Notes

Date May 17, 2017 -DRAFT
 Project No. D23480
 Project Name MWCOG – Mont. County
BRT Design – Workshop 2
 Page No. 4

- c. Will separating the BRT and local stops be confusing or annoy riders if they need to switch platforms?
- d. How will a rider know what bus will come first?

11. Sustainability strategy

- a. PV- photovoltaics.
- b. Pedestrian activity energy production such as Dupont Circle Overlook (Pavegen).
- c. LID Landscape.

12. Lighting

- a. Safety for users is minimal requirement.
- b. Visibility for approaching bus should be considered.
- c. Consider subdued lighting for general illumination and reduction of light pollution.

13. UNIQUE FEATURE – What is this for Montgomery County? What is the hook to sell the design?

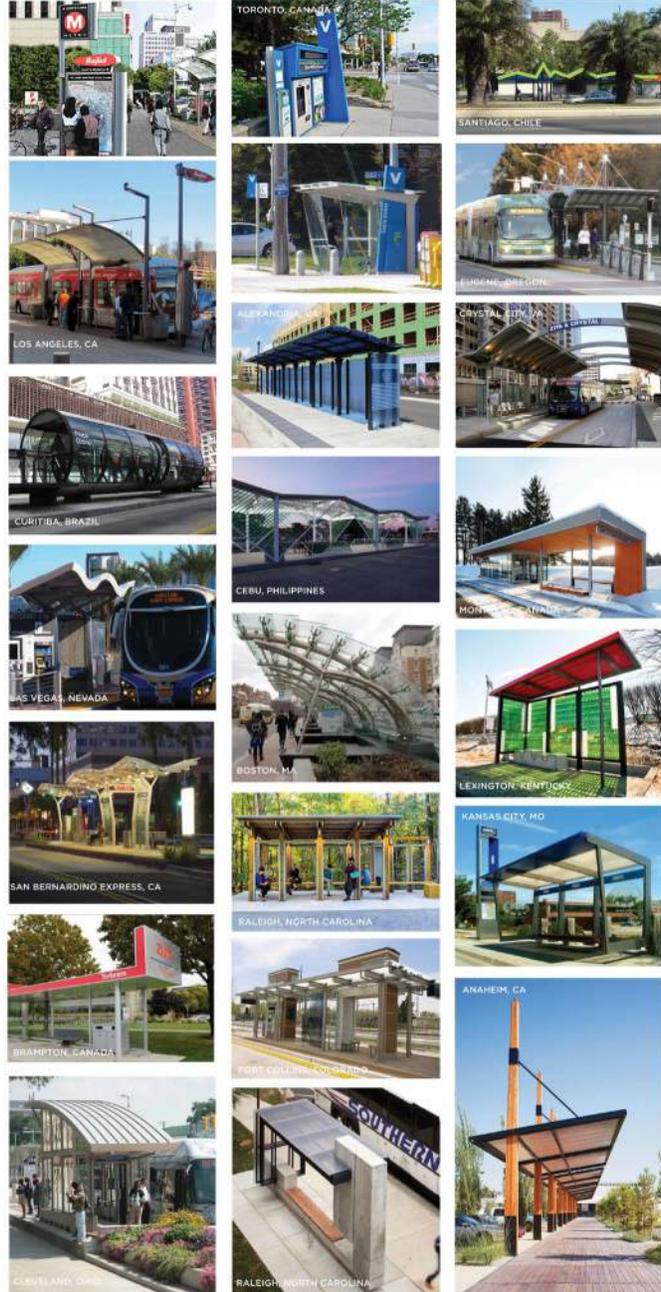
Concluding remarks:

- Boards will be sent out to group for additional feedback.
- Workshop 3 will include a refined development of a single concept “#5”, with some variables including public art opportunities, sustainability, clarification on standard versus custom features.
- Workshop 3 will be scheduled in a follow-up email.

BRT SHELTER DESIGN

Examples

SCALE, FORM, IMAGE & ENCLOSURE



MATERIAL



TRANSPARENCY



LIGHTING



DESIGN INFLUENCES

Reflecting Montgomery County

WORD CLOUD SNAPSHOTS

Describe in one word how a design might reflect the character and quality of Montgomery County?

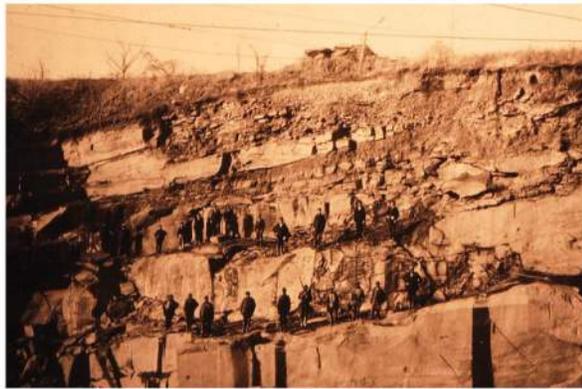
February 7
Open House
Germantown



February 8
Open House
Rockville



THE COUNTY LANDSCAPE

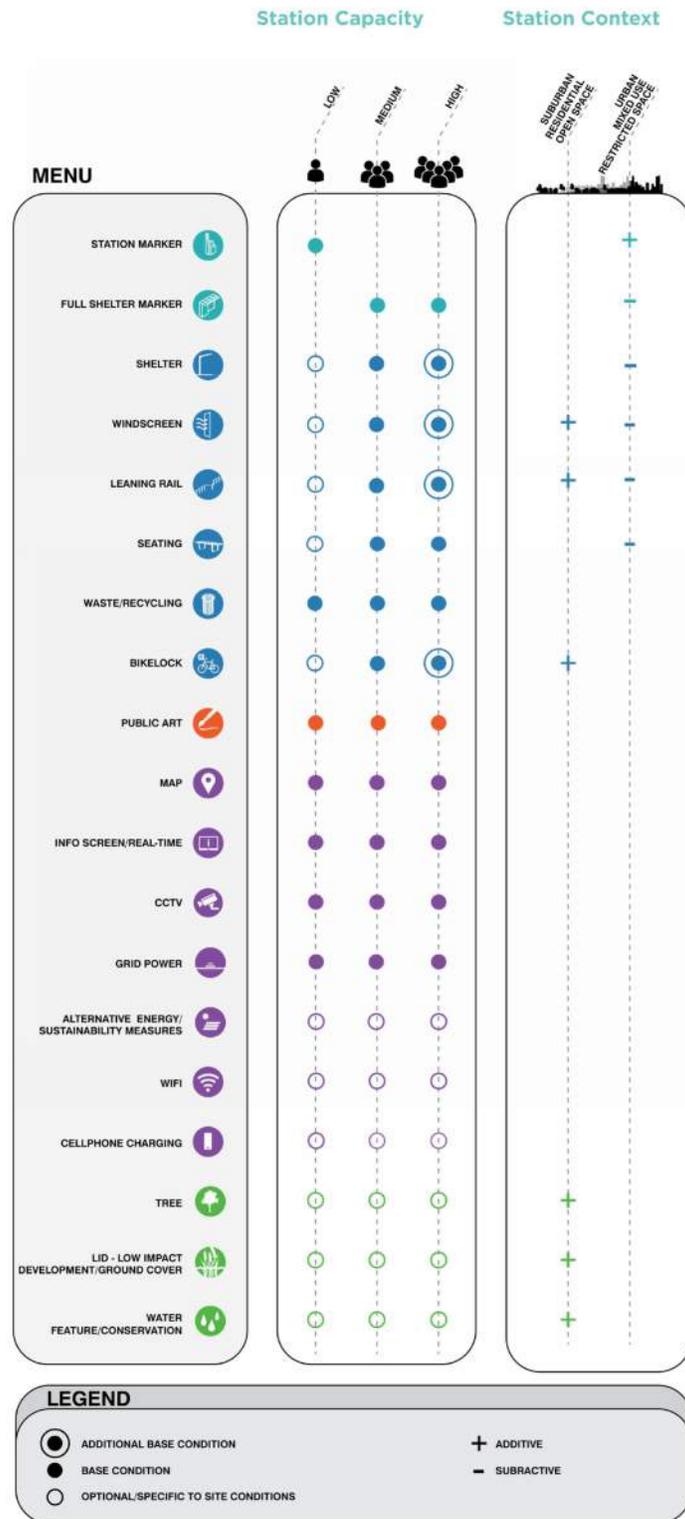


Historically Quarried Stone in Montgomery County

Seneca Red Sandstone (far left)
Sykesville Gneiss (left)
Potomac Marble (above)

STATION COMPONENTS MATRIX

Program, Capacity and Context

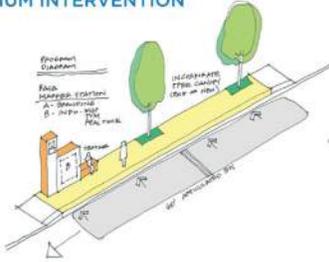


CONCEPTUAL FRAMEWORK

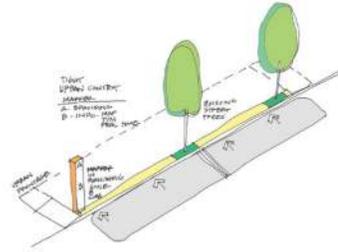
Station Typologies

1 THEME - PAVILION(S) IN A STREETSCAPE GARDEN

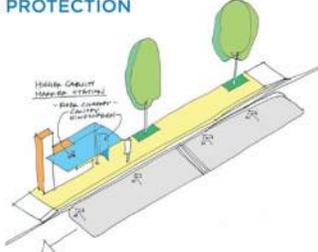
STATION MARKER & LANDSCAPE MINIMUM INTERVENTION



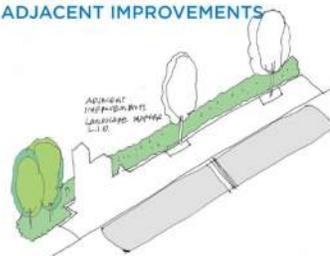
STATION MARKER TIGHT URBAN CONTEXT



FULL SHELTER MARKER RIDER PROTECTION

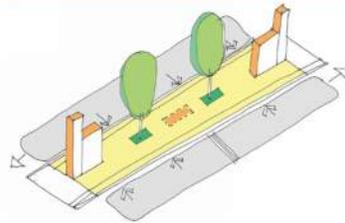


LANDSCAPE MARKER / ADJACENT IMPROVEMENTS

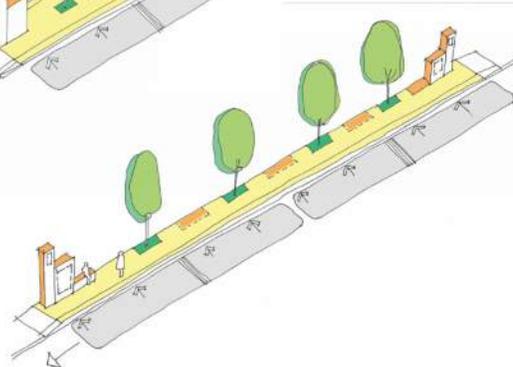


2 ADAPTABILITY

CENTER PLATFORM MARKERS AT END

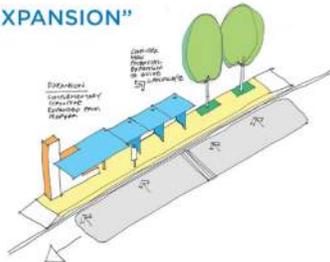


DOUBLE PLATFORM MARKERS AT END

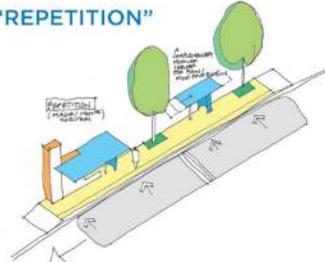


3 INCREASING CAPACITY - LANDSCAPE STRATEGY

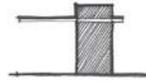
"EXPANSION"



"REPETITION"



SHELTER - CONCEPTS

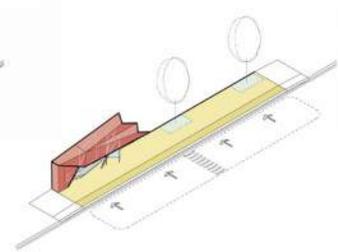
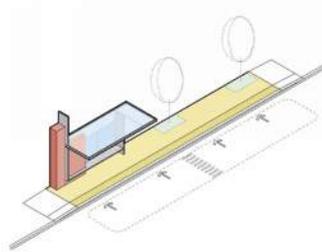


PLAINS

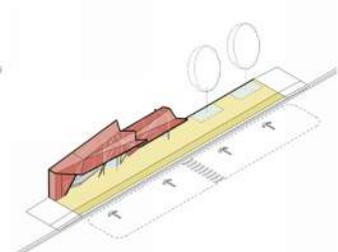
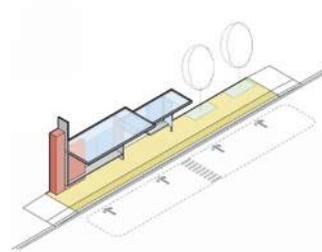


FACET

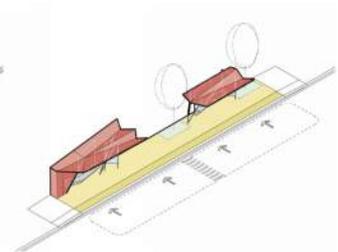
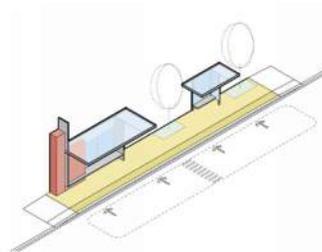
FORM



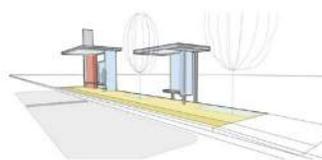
EXPANSION



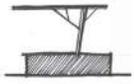
REPETITION



STATION VIEW



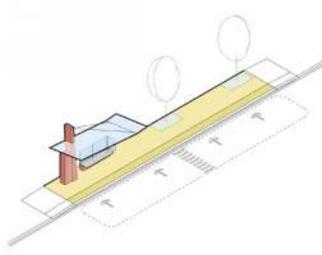
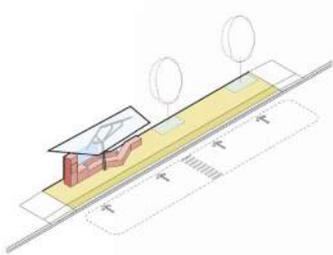
SHELTER CONCEPTS



UPLIFT



SAILS



Evaluation Discussion

- To guide refinement

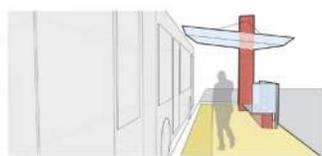
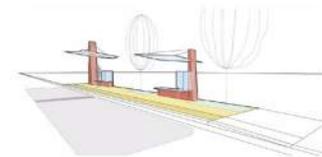
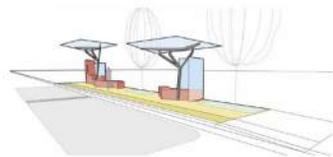
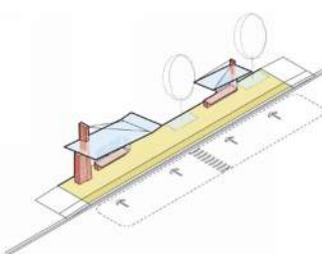
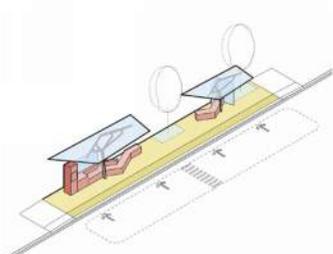
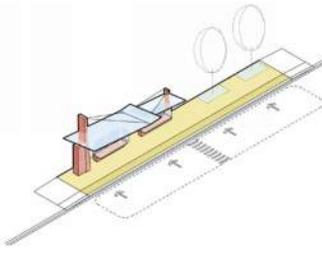
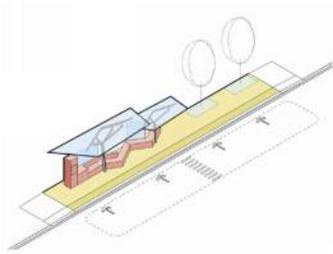
Image and Visual presence?

Visually complete at each capacity level?

Shelter, Furnishings, Landscape

Transparency?

Across Station Area & Canopy



CONCEPTS

Twinbrook

PLAINS



MINIMUM MARKER



FULL SHELTER MARKER



EXPANSION



REPETITION

FACET

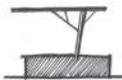


EXPANSION



REPETITION

UPLIFT

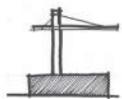


EXPANSION



REPETITION

SAILS



EXPANSION



REPETITION



Montgomery County Bus Rapid Transit Station Prototype Design MWCOG TLC Grant

Agenda: Workshop #3, April 18, 2017, 1-3 PM
EOB, 9th Floor Large Conference Room, 101 Monroe St, Rockville

- Introductions
- Workshop #1 & #2- Refresh
- Updates
 - US 29 Public Open House
 - MCDOT Review
- Prototype Station Concept - Discussion
 - Program of Requirements
 - Prototype Design - #5 Facet + Uplift
 - Conceptual Framework - Adaptability
 - Implementation - Test Fit Visualizations
 - Public Art and Branding
- General Discussion, Questions and Next Steps
 - Summary Report Submission, May 2017



Meeting Notes

Date May 22, 2017 -DRAFT

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design – Workshop 3

Page No. 1

Meeting Time & Location MWCOG TLC / MCDOT BRT Station Prototype Design – Workshop 3
1-3PM, April 18th, 2017, Montgomery County Executive Office Building, 9th Fl.
From ZGF

Meeting Agenda: See Attached
Meeting Attendees: See Attached
Meeting Exhibits: Refer to Exhibit Board PDFs, and summary below
To: MCDOT Client Group and Meeting Attendees

Meeting Summary: The following summary is intended to highlight key discussion items of the workshop.

Introductions

Related Work Updates – Joana Conklin provided an overview of the US 29 Public Open House and the review of the Station Prototype Design with MCDOT senior staff.

Exhibit Presentation

Otto reviewed the previous workshop materials for attendees that were not there. Otto and Chris provided an overview of the Workshop 3 boards. These boards were as follows:

- Station Components Matrix
 - Showing the amenities matrix based on station capacity and context
- BRT Prototype Design
 - This showed the typical shelter build out in perspectives, plans, elevation and section, along with rain shadow diagram.
 - Listed typical components and design intent for each
- Conceptual Framework (1 and 2)
 - Shows the conceptual build out of the stations from Urban with just a Marker and TVM to maximum buildout.
 - Also shows the concept for the pylon marker, LED integrated lighting, logo, real-time, and map, along with stone base and branding color
- Implementation
 - Shows 4 in situ renderings of sites along the corridors including: Twinbrook, Watkins Mill, Fenton, and Burtonsville Park & Ride. The icons used for the amenities matrix was also applied to these renderings.
- Public Art and Branding
 - Shows images for how Neighborhood oriented art can be applied to transit shelters, from canopy structure, windscreens, railings, furnishings and pavement. Also show options for 'Plop art'

Comments, Questions and Notes:

- Joanna: explain how smaller modules can make larger canopy if desired
- Windscreen: permanent (typical) or moving
- Splash Guards @ Curb?
 - Issues with coordination with bus doors.
 - Speed of cars etc will create a cloud of mist.
 - Provide square footage of shelters for total occupant load and occupant load in rain shadow
 - Lighting: Sensors to activate when in use?



Meeting Notes

Date May 22, 2017 -DRAFT

Project No. D23480

Project Name MWCOG – Mont. County
BRT Design – Workshop 3

Page No. 2

- How do we light the surrounding sidewalk or adjacent areas – this comment was based on the “lighting concept rendering” only showing the shelter specific lights.
 - Ensure there are not dark spots
 - Lighting of the bike rack area
 - Night rendering should show surrounding lighting – the render is not sited
 - If lights are off at certain times of night, will people sleep there?
- Description of public art and how it can influence behavior i.e.: graffiti – case studies or examples?
- Snow plow concerns
 - This is a maintenance issue, this also eliminates the ability to place guards for splash, if not from the door alignment issues, because the plow would destroy them
- Quantity of TVMS: would like to have two for redundancy – to decrease the wait times.
 - Shelters need redundancy even at low use stops
- Comments regarding size of signage on marker
 - Need to integrate screen, signage and other requirements. Where would line name go Vs. ‘Flash’?
- Need to add how many people can fit on a platform vs. under the canopy
- Add advertisement to the ‘menu’
 - Not everyone bought the location of where the advertisement board would go. Design team stated that most advertisers are concerned with the traffic from cars, not necessarily people that use the station. Suggest not to use it on within the shelter
- Pervious paver along the platforms seems to be a concern for ADA
 - Rick: platform area is below area required to meeting storm water requirements.
 - Thus no need to use impervious for storm water management.
- Headways vs. bus capacity - Are the stations sized appropriately?
- Paving - perhaps used stained concrete?
- Each platform concentration needs to have metrics
 - Area, Rider Capacity, Rain Shadow
- Other Lines (not 29)
 - May just impose a typ. Station everywhere?
- How will the bike lane interact with the station
 - Currently plans show the bike lane going behind the station.
- Concerns with platform size and overhead wires – this will significantly increase the cost of the stations.
- Biggest complaints with current stops are coverage and seating.
- New stops in MC will have real time screens that are 30” screens. Has a route map with dot for bus location. Currently a working prototype. Similar to the real-time screen on 16th St. in DC.
- If stop ‘sign’ is on the marker @ top. Can it be seen where needed?
 - Should additional signage at roofline be addressed?
- Will report identify maintenance?

Concluding Remarks

- Report will be published at the end of May, with intent to respond to the Workshop questions. An order of Magnitude Planning Cost will be included in the report.

BRT PROTOTYPE DESIGN

#5 - Facet + Uplift

COMPONENTS

- MARKER W/ LOGO, REAL TIME & MAP (STONE, METAL, INTEGRATED LED LIGHT)
- TICKET VENDING/READING MACHINE - TVM (FREE STANDING - ASSUME PARKEON STRADA OR GALEXIO)
- CANOPY STRUCTURE (METAL, INTEGRATED LEANING RAIL, LIGHTING)
- CANOPY ROOF PANELS (OPTIONS - SOLID OR GLASS, FOLDED OR FLAT, DRAINAGE TO LANDSCAPE)
- WINDSCREEN (FREE STANDING - BACK, SIDE, FRONT)
- SEATING (STONE, WOOD)
- TRASH/RECYCLING RECEPTACLE
- LANDSCAPE - L.I.D. TREES AND PLANTINGS

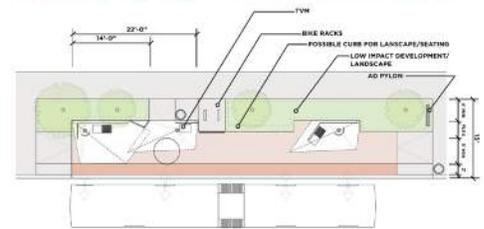
ADJACENT IMPROVEMENTS

- ACCESS
- LANDSCAPE MARKER STORMWATER MANAGEMENT
- BIKE RACKS

PERSPECTIVE



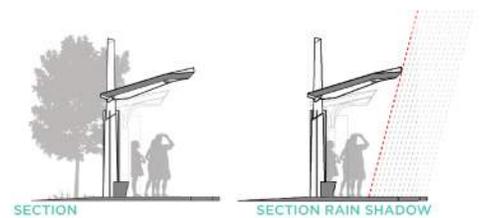
PLAN W/ GENERAL ADJACENT IMPROVEMENTS



ELEVATION



SECTION

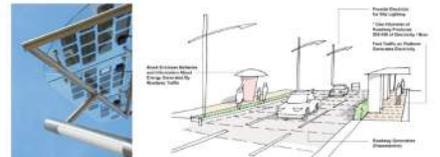


SUSTAINABILITY

Stormwater Management & Enhanced Landscape



Energy Production - PV, Kinetic

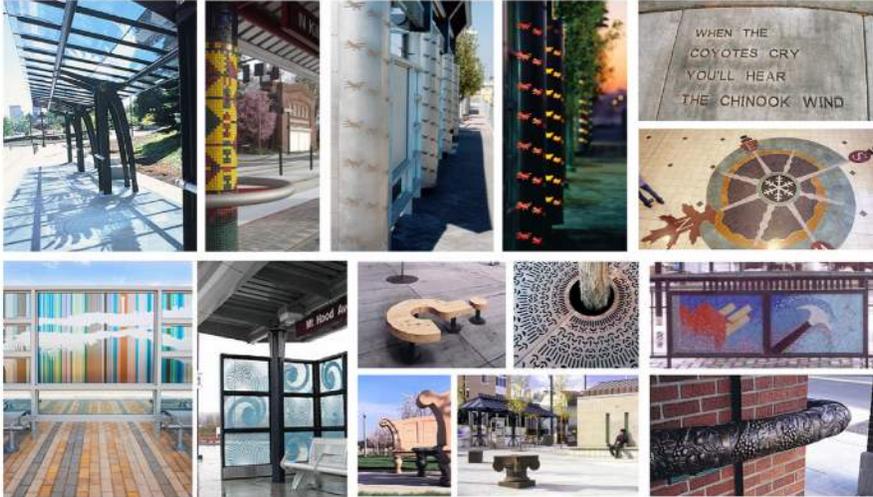


PUBLIC ART + BRANDING

Integrated and Complementary

Neighborhood Oriented Art

Canopy Structure, Windscreens, Railings, Furnishings, Pavement



Stand-alone "Plop Art", Adjacent Improvements



System, Line & Station Identification

System Maps



Markers + Line Maps

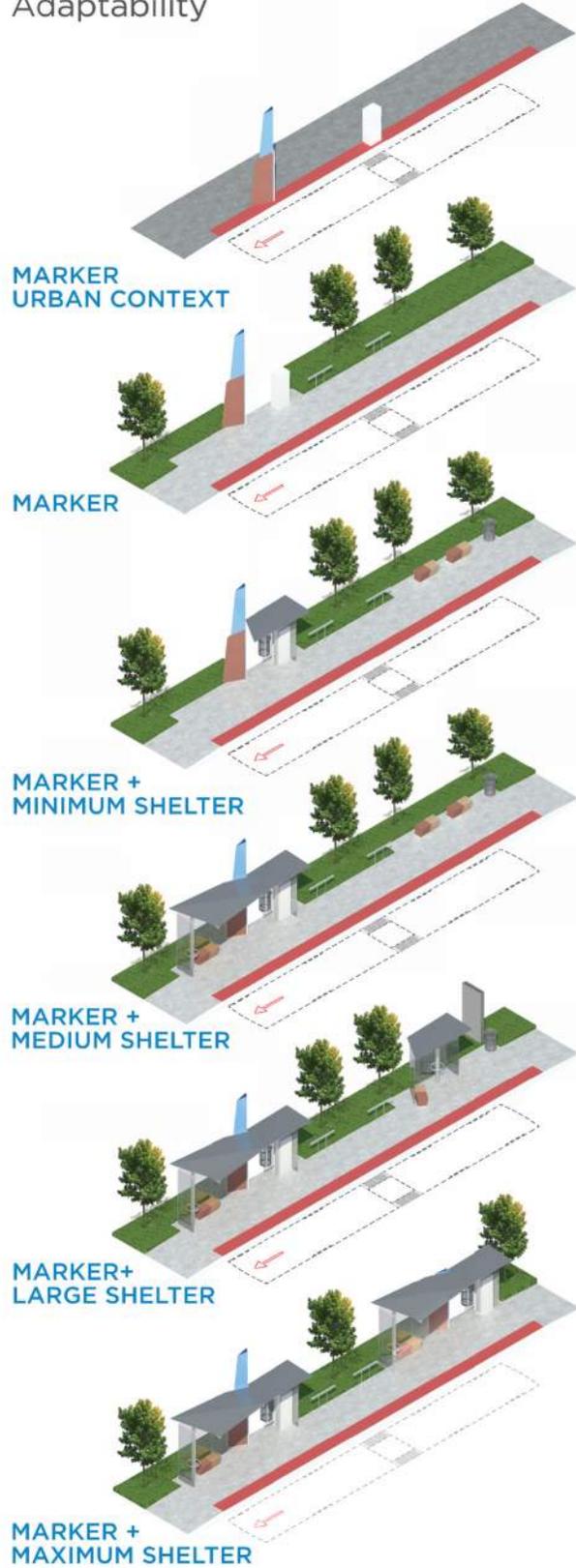


Line Designation, Station Names, Color + Iconography



CONCEPTUAL FRAMEWORK

Adaptability



CONCEPTUAL FRAMEWORK

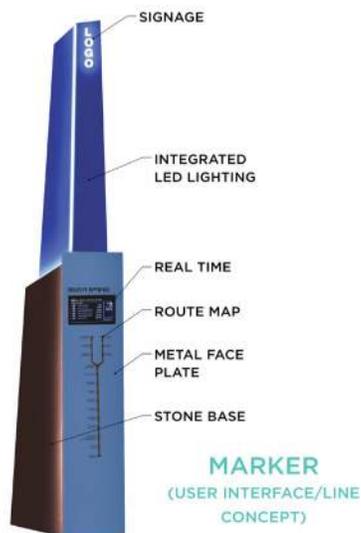
Adaptability



DOUBLE PLATFORM
MARKERS AT END



CENTER PLATFORM
MARKERS AT END



IMPLEMENTATION

Test Visualizations

SUBURBAN RESIDENTIAL / SHARED BUS STOP

TWINBROOK



SUBURBAN COMMERCIAL

WATKINS MILL RD



URBAN MIXED-USE / CONSTRAINED CONDITIONS

FENTON



NO SHELTER



MINIMAL SHELTER



PARK & RIDE / HIGHEST CAPACITY

BURTONSVILLE

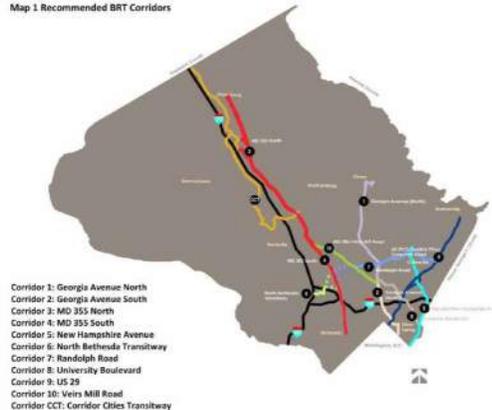


US 355 OPEN HOUSES

FEBRUARY 7 & 8, 2017

MCDOT BUS RAPID TRANSIT (BRT) STATION PROTOTYPE DESIGN

Map 1 Recommended BRT Corridors



Project Description

- MCDOT received a grant from the Metropolitan Washington Council of Governments Transportation/Land-Use Connections Program (MWCOG TLC) to develop a BRT Station Prototype for the County's future BRT Network.
- The design scope is to develop a Prototype Station Design with interchangeable, modular components, that can be adapted for all corridors with an initial focus on MD 355, MD 586 and US 29.
- The grant requires the project to be complete by June 2017. The project consultants are ZGF Architects and Wiles Mensch.

Station Design Goals

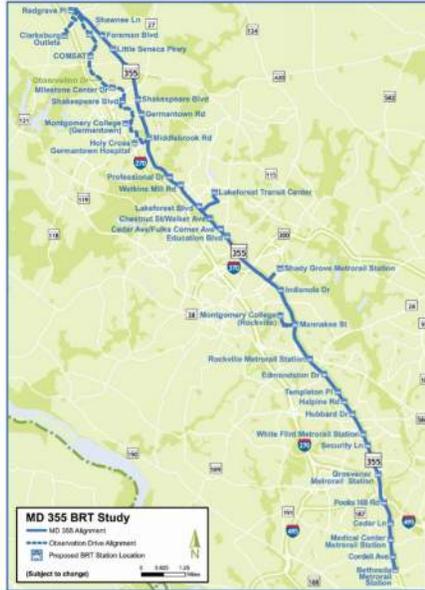
- Design Stations to support:
 - Arrival & Waiting (*identity, accessibility, amenities & information*)
 - Ease of Use (*wayfinding/branding*)
 - Rider Experience and Comfort (*aesthetics, safety, weather protection*)
- Design Stations to fit & enhance context (*scaled appropriately, sustainability & stormwater management*)
- Other?

Operations & Maintenance Goals

- Design to support efficient BRT and local bus operations (*from vehicle maneuvering to fare collection*)
- Design to consider operations (*utility requirements*), maintenance (*cleaning, snow removal*), and investment (*life cycle costs*)
- Other?

MD 355 STATION AREAS

Context and Station Type - Examples



- Station Types**
- T Transit-Metro/Park & Ride
 - I Institutional / Civic
 - P Park / Open Space
 - R Suburban Residential
 - C Suburban Commercial
 - M Urban Mixed-Use



STATION DESIGN ELEMENTS

Capacity and Program

MENU

- STATION MARKER
- FULL SHELTER MARKER
- SHELTER
- WINDSCREEN
- LEANING RAIL
- SEATING
- WASTE/RECYCLING
- BIKELock
- PUBLIC ART
- MAP
- INFO SCREEN/REAL-TIME
- CCTV
- GRID POWER
- ALTERNATIVE ENERGY/SUSTAINABILITY MEASURES
- WIFI
- CELLPHONE CHARGING
- TREE
- LID - LOW IMPACT DEVELOPMENT/GROUND COVER
- WATER FEATURE/CONSERVATION

Station Capacity

HIGH
MEDIUM
LOW

Station Examples

LEGEND

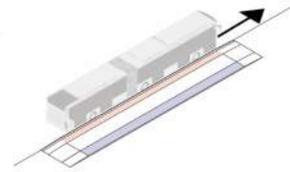
- REQUIRED
- OPTIONAL/SPECIFIC TO SITE CONDITIONS

STATION PLATFORM TYPES

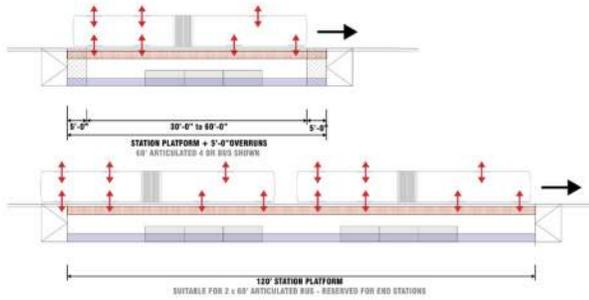
SIDE-LOADING PLATFORMS

SECTION - SIDE LOADING PLATFORM

PERSPECTIVE - SIDE LOADING PLATFORMS



PLANS - SIDE LOADING PLATFORMS



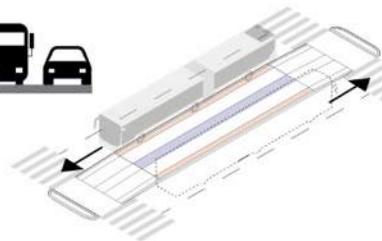
Shelter Examples



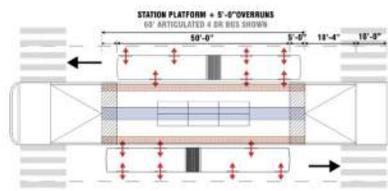
CENTER-LOADING PLATFORMS

SECTION - CENTER LOADING PLATFORM

PERSPECTIVE - CENTER LOADING PLATFORMS



PLAN - CENTER LOADING PLATFORM



DESIGN IDENTITY & CHARACTER

Reflecting Montgomery County

DESCRIBE IN ONE WORD HOW A DESIGN MIGHT REFLECT THE CHARACTER AND QUALITY OF MONTGOMERY COUNTY

FEBRUARY 7 OPEN HOUSE

MONTGOMERY COLLEGE, GERMANTOWN



FEBRUARY 8 OPEN HOUSE

EXECUTIVE OFFICE BUILDING, ROCKVILLE



US 29 OPEN HOUSES

MARCH 7, 13 & 15, 2017

BRT Station Prototype Design

PROJECT INTRODUCTION

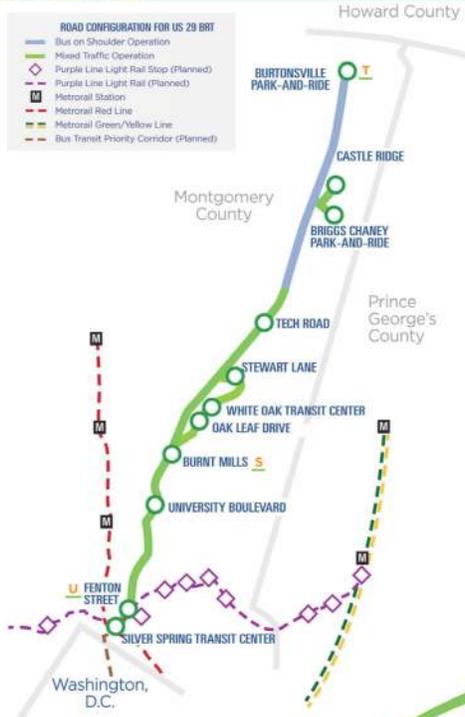
MCDOT, in partnership with the Metropolitan Washington Council of Governments' Transportation/Land-Use Connections Program, is designing stations for the County's future BRT network. These stations will not only be the prototype for BRT stations in the County, but the resulting design will be the first BRT station design implemented as part of the US 29 BRT corridor project. These stations will have interchangeable, flexible components, that can be adapted for all corridors.

We need your input as part of the Get On Board BRT program to ensure the station design reflects your ideas of what truly reflects that County's character and aesthetic. Please review the boards in this station area, and participate in our interactive activity!

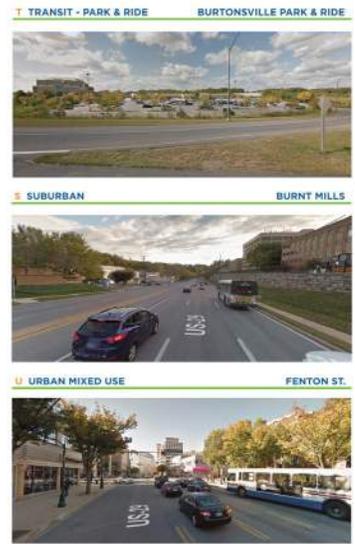
STATION DESIGN GOALS

- Easy to find and use
- Accessible
- Safe and comfortable
- Context sensitive and adaptable
- Supports efficient operations
- Maintainable
- Good life-cycle investment

US 29 BRT CORRIDOR



US 29 STATION AREAS



GetOnBoardBRT
BUS RAPID TRANSIT IN MONTGOMERY COUNTY

Station Design Criteria

STATION PLATFORM TYPES

There are two station platform types:

- Side-loading - which may be accessed directly from a sidewalk
- Center-loading - which may be located in a roadway median

SIDE-LOADING PLATFORMS

SECTION DIAGRAM



Adjacent Conditions Vary

CENTER-LOADING PLATFORMS

SECTION DIAGRAM



AMENITIES

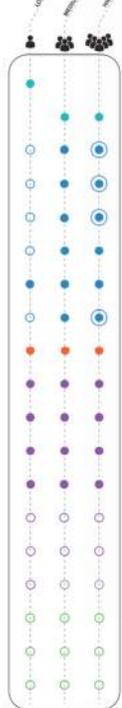
LEGEND

- ADDITIONAL BASE CONDITION
- BASE CONDITION
- OPTIONAL SPECIFIC TO SITE CONDITIONS
- + ADDITIVE
- SUBRACTIVE

AMENITIES

MENU	LOW	MEDIUM	HIGH
STATION MARKER	●	●	●
FULL SHELTER MARKER	●	●	●
SHELTER	○	●	●
WINDSCREEN	○	●	●
LEASING RAIL	○	●	●
SEATING	○	●	●
WASTEBIN/CYLIND	○	●	●
BIRDLACK	○	●	●
PUBLIC ART	○	●	●
MAP	○	●	●
INFO SCREEN REAL-TIME	○	●	●
CCTV	○	●	●
USB POWER	○	●	●
ALTERNATIVE ENERGY/WEATHERABILITY MEASURES	○	●	●
WIFI	○	●	●
CELLPHONE CHARGING	○	●	●
TREE	○	●	●
LI2-LOW IMPACT DEVELOPMENT/GROUND COVER	○	●	●
NEED FEATURING CONSIDERATION	○	●	●

STATION CAPACITY

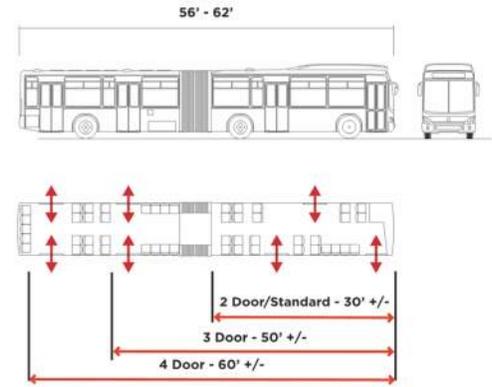


STATION CONTEXT



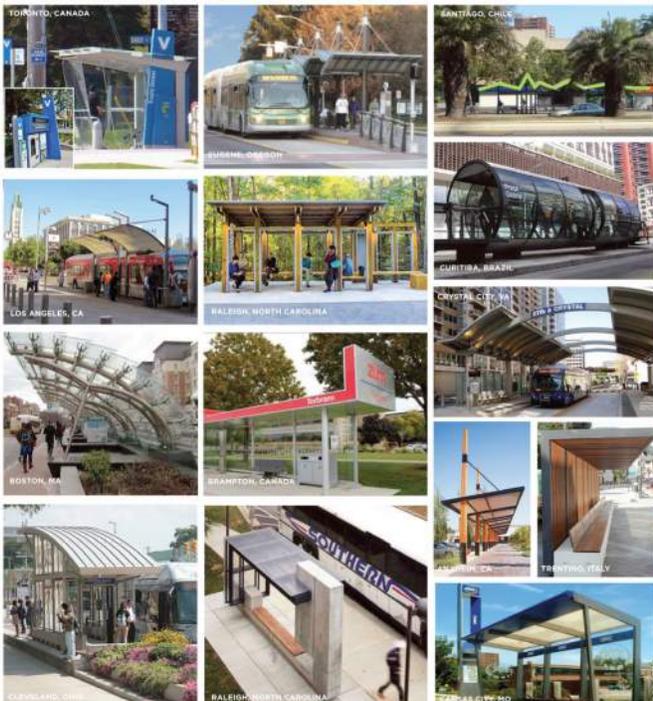
POTENTIAL BUS

Articulated buses, with doors on both each side of the bus, will be used for premium transit service. The multiple doors will allow for more efficient passenger loading and unloading, flexibility for both side and center loding platforms and will support faster, overall travel times.



Station Shelter Examples

SCALE, FORM, IMAGE & ENCLOSURE



MATERIAL



TRANSPARENCY



LIGHTING



